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(B. DUNSTAN, GOVERNMENT GEOLOGIST.)

PUBLICATION No. 225.

COAL MEASURES OF SOUTH-EAST MORETON

(REPORT ON)

WITH TWO MAPS AND SECTIONS, ONE FIGURE, AND FIVE PLATES.

BY

E. O. MARKS, B.A., B.A.I. (Dubl.)

ASSISTANT GOVERNMENT GEOLOGIST.

BRISBANE:
BY AUTHORITY: ANTHONY JAMES CUMMING, GOVERNMENT PRINTER.

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COAL MEASURES OF SOUTH-EAST MORETON.

I.—INTRODUCTORY.

Formerly it was thought that coal-bearing beds occur promiscuously throughout the Trias Jura system in South-east Queensland, and might, with equal prospects of success, be sought in any part thereof. That this is not the case in the lower portion of the system as developed near Ipswich was shown by Mr. W. E. Cameron in his second report* on the West Moreton (Ipswich) Coalfield. The present report may be considered largely as a continuation eastward of Mr. Cameron's work. Apart from an inspection of the known outcrops of coal in the district under consideration, the main object kept in view in performing the field work necessary for the preparation of this report has been to determine, as far as the somewhat scanty geological features allow, the areas within which coal may be considered likely to occur and to which future prospecting operations should be confined; since the coal measures examined open a considerable field for prospecting operations, it is hoped that this feature of the present work will not prove the least useful.

Many of the localities within the area examined have been known to possess coal, or coaly strata, from the time of, or soon after, the first occupation of the land by white men. Since that period efforts have been made at infrequent intervals to discover the existence of payable seams of coal, but, with a few exceptions, the work has not been carried to any depth, and of what was done there is, as a rule, no record now obtainable. With these few exceptions the prospecting work has given us no information as to the strata pierced, and cannot be considered in any way to have tested the ground, to which end it may be said that over most of the area nothing at all has been done. Almost the only information obtainable is from what can be seen on the surface, and this, in the majority of places, is very little.

The occurrence of coal having been known, and prospecting operations having been carried on, over so long a period, the district has in consequence previously received the attention of geologists on several occasions, though no examination of a detailed nature appears to have been attempted. The earliest published record is by

* Geological Survey Publication No. 204.

Stutchbury, in his reports to the New South Wales Government before the separation of Queensland from New South Wales. In his thirteenth report, dated 20th May, 1854, he says: "I again visited the bay, and on the way down stopped at the 'stone quarries,' stituate in the parish of Bulimba, about eight miles down the Brisbane River, on the south side, where I had before observed coal in the banks upon land belonging to Mr. Charles Coxen. The coal presents a weathered surface of nearly ten feet in thickness." Later on he says that coal was known to exist on the Albert and Logan Rivers.

The next record is not until 1879, and is found in the report on the "Geological Features of the South-eastern Districts of the Colony of Queensland," by A. C. (afterwards Sir A. C.) Gregory, at that time geological surveyor for South Queensland. Except for the map, however, he gives little information about the area with which this report deals.

Mr. W. H. Rands, in 1887, prepared a "Geological Map of the City of Brisbane and its Environs, accompanied by a report,"* and in the same year reported on the "Geology and Mineral deposits in the neighbourhood of Beenleigh and the Logan and Albert Rivers,"† in 1889 making a further report on the "Albert and Logan Districts,"‡ this latter report being accompanied by a map and sections. In these Mr. Rands deals with the greater part of the area at present under consideration, and as, in many cases, the prospecting shafts which are now no longer accessible were open at the time of his visit, constant reference will be made to his work in dealing with these localities.

In his Annual Progress Report for 1895§ Dr. Jack records some observations on "Coal near Brisbane," further reference to the same subject being made also in his Annual Progress Report for 1897.‖

In the "Queensland Government Mining Journal" for June, 1904, are some notes on "Sinking for Coal in the Logan District," and this, with some notes by Mr. L. C. Ball, in the same journal for November, 1907, on "The Occurrence of Coal in the Vicinity of Brisbane," and by Mr. Cameron, in the journal for January, 1907, on "Coal and Gravel at Nundah," completes the list of previous publications containing information on the coal-bearing strata in the area embraced by the present report and to which reference will be made as occasion demands.

The present report, while bringing the information up to date, should, besides showing their limits, serve to draw attention to the

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* G. S. Publication No. 34.
† G. S. Publication No. 36.
‡ G. S. Publication No. 51.
§ G. S. Publication No. 108.
‖ G. S. Publication No. 143.

large areas covered by strata which give every likelihood of including coal seams of a workable thickness, the presence or absence of which can of course only be determined by means of boring or other prospecting work. Hitherto, what work has been done has been carried out, so to speak, in the dark, and has taken the form of a blind probing in the hope of finding coal rather than of an attempt to prove definitely its presence or absence. While it is hoped that the present report will, by throwing a considerable amount of light on the geology of the strata, be of assistance in future prospecting operations, the desirability cannot be too strongly urged of preserving the records of all future prospecting work, as finality can only be attained by the accumulation of such information, the lack of which is likely to cause needless expenditure in after years. The bores on Archerfield may be cited as an example of the loss of information which would have been of very great value at the present time, and to obtain which it may in the future be desirable to bore again. The greater part of the coal-bearing formation is favourably situated for transit purposes and well deserves to be thoroughly prospected. That this has not already been done, at any rate near Brisbane, is remarkable, the advantages both to the proprietors and to the city of a coalfield at the mouth of the Brisbane River being so obvious.

In preparing the map to accompany this report advantage has been taken of the work previously done in the neighbourhood of Brisbane by officers of this survey ; away from Brisbane, however, very little work of a detailed character had hitherto been attempted.

In the field the writer had the benefit during the greater part of the time of the assistance of Mr. R. Macdonald, to whom the determination of much of the geological boundaries is due, as well as many of the coal analyses. An acknowledgment should also be made of the great assistance rendered by those who, throughout the country traversed, spared no trouble to point out the features of the localities with which they were familiar, and to obtain information regarding them.

While it is not pretended that, in the seven months occupied in the field, so large an area has been examined in the utmost detail, it is confidently expected that any errors or omissions which may occur will not be found of any importance. As is stated in dealing with the various localities, the geological boundaries cannot always be determined closely; where this is the case the dotted boundary line has been dispensed with on the map, the colouring alone indicating the probable extent of the formation which it represents.

The Trias Jura system, with which this report is chiefly concerned, has only been examined in detail as far south as Beaudesert, and the geological map extends southward only to this point. As, however, seams of coal were observed in several places to the south of this, a small scale map has been attached to show their location.

In dealing, in the following pages, with the various formations met with, the sedimentary rocks have been considered in the order of their age—viz. :—

1. Palæozoic schists.
2. Trias Jura system.
3. Oxley beds.

The igneous rocks being considered in a separate section.

II.—PALÆOZOIC ROCKS.

The Palæozoic rocks within the area under consideration have long been classed with the Gympie Formation (Permo Carboniferous), on account of their apparent continuity with the rocks of Gympie, there being lack of fossil evidence by means of which to definitely determine their age. No fossils have yet been found in these rocks near Brisbane, and their generally metamorphosed nature renders it improbable that any should have been preserved. These rocks consist mainly of clay and talcose, sometimes micaceous, schists, and include rocks varying from a hard massive quartzite to a soft sandy schist, which weathers to a sandy soil and may even be mistaken in hand specimens for an ordinary sandstone.

To this formation, which underlies the Trias Jura and forms the basement of the district, but little attention has been paid beyond mapping in its boundary. Mr. Rands has, however, in each of his reports dealt at some length with the schists and the occurrences of gold which had been prospected at that time.

The area occupied by this formation, as indicated on the map, probably includes several minor patches of basalt to the south of Beenleigh, no attempt having been made to examine these rocks away from their margin. To the south of Redland Bay, nearly as far as the Logan River, is an area of country in which no rocks can be seen, and in which the slightly sandy soil might with equal reason be ascribed to either the Gympie or Trias Jura Formations; the nearest rocks being schist, both to the north and south, it has been included as such on the map.

At the south-eastern end of the basaltic mass of Tambourine Mountain, and extending across the Coomera River, is a peculiar rhyolitic rock, the relation of which to the other rocks has not been observed except that it is apparently beneath the basalt. Lying as it does outside the Trias Jura area, no attempt was made to map the limits of this rock, which has been included on the map with the schists.

The boundary between the schists and the rocks of the Trias Jura system forms a very irregular line, and inliers of the older formation are numerous. This junction line, though probably in many places a faulted one, is apparently the result of denudation

of sediments which had been deposited on a very uneven floor, the inliers for the most part consisting of quartzite and hard siliceous schists, which would have formed high hills in Trias Jura times, as they do at the present.

III.—GENERAL GEOLOGY OF THE TRIAS JURA SYSTEM.

The Trias Jura system has previously been subjected to a detailed examination only in the neighbourhood of Ipswich, and Mr. Cameron's second report on that coalfield throws much light on the geology of the system as developed in the districts now under consideration. In this report Mr. Cameron considers the system is made up of two Stages, the First being divided into—

1. Ipswich Beds, of a probable thickness of 2,500 ft. These beds consist mainly of sandstones and shales interbedded with 14 or 15 seams of bituminous coal, and having coarse conglomerates at their base.

2. Bundanba Beds. Succeeding conformably the Ipswich beds is a series of sandstones, grits, and conglomerates which have, so far, except for a small seam near the base, proved unproductive.

The Second Stage, to which Mr. Cameron has given the name of the Walloon Beds, occupies a higher horizon than the first, though the exact relationship cannot be seen in the Ipswich district. The Walloon beds are characterised by coals which, like those of the Darling Downs, are of the nature of a cannel coal—highly gaseous, hard, and breaking with a conchoidal fracture, in contrast to the more brittle bituminous coal of the Ipswich beds. Mr. Cameron was unable to discover any Palæontological distinction between the two series.

This division of the Trias Jura is of great importance, as it supplies the key to the geology of the system as developed in the areas now under consideration, at the same time receiving confirmation therefrom, showing that it is not merely a local development peculiar to the Ipswich field.

While amply justified in the districts embraced in the present report, the division is unfortunately one that does not always lend itself to satisfactory mapping in the field, for the distinction between a series of shales interbedded with sandstones and a series of sandstones which may be accompanied by shales is not one which can be readily made with certainty, especially where, as is often the case, natural sections are rare. In some localities, however, the contrast is very sharp between the coal measures (Ipswich beds) and the overlying Bundanba sandstones, the soft coaly shales giving place to a hard, coarse sandstone, which, by its weathering, forms large areas of poor sandy soil, and, where the strata are inclined, makes a rugged

escarpment over the softer beds beneath. The coarse hard sandstones immediately overlying the coal measures near Logan Village become, on the whole, softer and more impure as they are traced upwards, and are not infrequently calcareous. Traced further, these beds appear to pass, without break in the geological sequence, into the coal-bearing beds of the Beaudesert district, the coals of which are of the Walloon and Darling Downs type. Except for the occurrence of carbonaceous strata, there is nothing to indicate the horizon at which these Beaudesert coal measures may be considered to replace the apparently barren sandstones, and the mapping must therefore, in the absence of prospecting, be entirely tentative. Though the connection has not been traced between these and the Walloon measures, their geological position and the nature of their coals leaves little room for doubt as to their identity.

The Trias Jura in South-East Moreton may be considered as being composed of three stages—

1. Lower or Ipswich coal measures;
2. Bundanba grits and sandstones (barren);
3. Upper or Beaudesert (Walloon ?) coal measures.

As, however, little is known of the upward limits of the Walloon beds which examination in other places may not unlikely show to consist of more than one series of coal measures, it is perhaps advisable to adhere to Mr. Cameron's division into two stages, the first of which includes the Lower coal measures and the barren Bundanba sandstones, and the second stage the Beaudesert or Walloon coal measures, the upward extension of which at present is unknown.

IV.—LOWER OR IPSWICH COAL MEASURES.

The lower coal measures outcrop in four main areas, which will be considered separately, as—

1. Kingston-Logan Village Area;
2. Mouth of Logan River Area;
3. Broadwater-Tingalpa Creek Area;
4. Coastal Area;
5. Yeronga Area.

1.—Coal Measures of Kingston-Logan Village Area.

As will be seen on the geological map, the coal measures of this area occupy a narrow strip of country fringing the border of the schists and attaining its greatest width where surrounding the inliers of that formation in the neighbourhood of Kingston, while to the south, though it may be open to doubt whether the whole thickness of the measures appears on the surface, the outcrop becomes very much reduced, not being observed south of Tamborine Mountain.

Commencing at the north, the first occurrence of carbonaceous strata met with is in portion 407, known as Shailer's, where black and coaly shale can be seen near the head of the main gully, at the present time rendered impassable by the dense growth of lantana. Mr. Rands, in his 1887 report, records a section "12-13 ft. thick, of alternate layers of coal and a very carbonaceous shale with one small band of sandstone about 4 in. thick. The bottom is said to contain the best coal. From this part I broke off a few large lumps of hard bright coal. The thickest coal without bands is from 15 to 18 in. thick. The bed is dipping about 6 deg. to the N. 35 deg. E." Mr. Rands also gives the following analysis of the coal:—

	Per cent.
Moisture	1·00
Volatile hydrocarbons	24·14
Fixed carbon	50·31
Ash	24·35
	100·00

The coke was brittle and compact, the ash light-grey in colour.

Since the time of Mr. Rands' visit a considerable amount of work has been done, to judge by the material brought to the surface. At least three tunnels or shafts have been put in the side of the hill, the resulting débris being almost entirely a black coaly shale. The boundary of the schists is on the eastern side of the gully, round the head of which it turns in a north-west direction.

Sandstone overlies the shale on the western side of the gully, and forms the high ground which continues from here west to near the main Logan road. This high ground presents a steep face to the southward, where it drains into the Logan, while the fall northwards into Priest's gully is gradual.

In portion 121 (Dennis') Mr. Rands saw the following section:—

	Ft.	in.
Black carbonaceous shale	7	0
Argillaceous and carbonaceous sandstone	1	0
Brown sandy shale	5	0
Coal	0	6
Fissile grey shale, thickness unknown.		

Beneath this again is a thick bed of yellow sandstone. The dip of the strata here is 5° N. 35° E. No prospecting work has been done here since Mr. Rands' visit, and the gully, like that at Shailer's, is now impassable, owing to lantana. Mr. J. Dennis pointed out a small quarry, where sandstone was obtained some years ago for making grindstones, for which purpose it is said to have proved very suitable. In portions 394 and 395 is a sandstone ridge, known locally as the Table Top; the sides, steep and rugged, form the western end of the elevation referred to above.

Carbonaceous shale has been brought up from a well in the station yard at Loganlea, which, Mr. Bollman states, was sunk to a depth of 60 or 65 ft., two small seams of coal being met with—a 6-in. seam at 25 ft., and a 1-ft. seam at about 60 ft. In the road to the south of the station and close to the boundary of the schists is some of the volcanic tuff which forms a prominent geological feature near Brisbane, and to the importance of which reference is made at the end of this section.

In portion 393, close to the railway, is an old shaft, at least 150 ft. deep, the débris around which is sandstone and shale, containing occasional streaks of coal. At the time of Mr. Rands' visit this was, he says, down to a depth of 60 ft., and had passed through—

	Ft.	in.
Sandstone and shale with bands of ironstone	35	0
Black shale with thin seams of coal (1-2 inches thick)	12	0
Black ca bonaceous shales (containing Pecopteris)	9	0
Hard grey sandstone (not yet through) ... ...,	3	0

The dip was 1 in 10 or 12 to the east

In a cutting to the north of Kingston, at the surveyed town of Booran, the strata—sandstone and a bed of shale—are seen dipping at 60° to the north-east, and further north at 45° to the north-north-east, while south of Kuraby Railway Station coarse sandstones and pebbly conglomerates, dipping at angles of 25° and 45° in a north-north-easterly direction from steep and rocky ridges and overlie some carbonaceous shales exposed in a gully near the corner of the old Brown's Plains timber reserve, close to the schist inlier on which, a little to the south, the sandstones rest directly.

Coal is reported to have been found during a drought many years ago in a waterhole in Scrubby Creek, between portions 266 and 257, and this discovery caused the late Mr. C. Kingston to do some prospecting work here, about which Mr. W. Hardie, who participated in the operations, kindly gives the information that in all ten bore-holes were put down, of a depth varying from 15 to 48 ft.

No. 5 bore, which was 48 ft. deep, passed through—

14 feet bands of shale
3 feet fine black shale
7 feet small bands of coal and blac stone intermixed
4 inches black shale
6 inches *coal*
1 inch stone
2 inches *coal*
8 inches light shale
3 feet coal and blac stone
1 inch pipeclay
4 inches *coal.*

Under this bored into 2 ft. hard blackstone.

No. 6 bore—

10 feet grey sandstone
4 feet light shale
1 foot hard blackstone
6 inches *coal*
16 inches blackstone and coal intermixed
1 inch pipeclay
3 inches *coal.*

Depth of bore, 33 ft.

No. 8 bore (40 ft. deep) passed through—

8 feet of dark shale and coal mixed.

Mr. Rands says of portion 266: "In a hole 17 ft. deep two 6-in. seams were cut, and a little further west, in a cutting in the bank a shale, full of streaks of coal, can be seen. Mr. Kingston informed me that in the bottom of the cutting a 16-in. seam of coal was met with. Dip, 7° W. 10° S."

In portion 252 is a shaft said to have been 30 ft. deep, in which the strata appear to have a dip to the west. The material brought up from this shaft is a black shale containing streaks of coal, while at another shaft in the neighbouring portion (227A), besides black shale, there are lumps of coal 3 or 4 in. thick, one of which gave, on analysis—

Moisture	1·7
Volatile hydrocarbons	24·8
Fixed carbon	43·3
Ash	30·2

This is probably the shaft which Mr. Hardie states was sunk on the site of No. 5 bore, 40 yards to the dip of which was No. 6 bore.

In portion 257, on the south side of Scrubby Creek, a shaft sunk by Mr. Eshelby in 1904 was visited by Mr. W. Fryar, in his official capacity of Inspector of Mines, at the time the work was in progress, and the "Queensland Government Mining Journal" for June, 1904, contains his report. In this report Mr. Fryar states that the shaft had then reached a depth of 75 ft., and that "The strata perforated gave the best possible indication of the presence of coal. . . . . It consists of sandstone, followed by arenaceous and aluminous shales (the latter fossiliferous), and lying more nearly horizontal than is usual in the district in which coal-mining operations are now being prosecuted, the dip being 1 in 15 or 16, and the country apparently undisturbed by contortions or dislocations, though this cannot be determined over any extensive area, owing to the alluvium which covers the outcrop of the strata. . . . A small band of coal which was passed through was of excellent quality." The shaft ultimately reached a depth of 105 ft.

Mr. Eshelby has also done some prospecting in portion 212, a shaft being sunk to a depth of 50 ft., from the bottom of which a bore, by means of a jumper drill, was put in 400 ft., making a total depth of 450 ft. Some coal is said to have been cut by the bore, but the nature of the drilling renders the information very uncertain. In the adjoining portion, 229, is a shaft, which was visited in 1902 by Mr. C. F. V. Jackson, the shaft then being 60 ft. deep, the bottom in a seam of shaly coal containing 60 per cent. of ash.

Probably owing to the small inclination of the strata hereabouts, the rocks are not exposed on the surface; to judge, however, by the nature of the soil, which to the west of this is poor and sandy, the boundary between the coal measures and the overlying sandstones must be in the neighbourhood of these two shafts.

About 2½ miles to the south-west of the above, Mr. Abrahamsen has sunk a shaft in portion 13v to a depth of 40 ft. From the information given and the specimens shown the shaft appears to have passed mainly through sandstone and a light grey sandy shale, a band of which contained streaks of coal; below this the sandstone became very hard, and further work was stopped. The dip of the strata in this shaft was to the south-east, while in another shaft, 30 ft. deep, to the north of this, in portion 14v (Swenson's), the dip is said to have been to the west or north-west. The dumps at both of these shafts show only sandstone and a little grey sandy shale, and both shafts are some distance from the outcrop of the coal measures, which are probably here at some considerable depth.

Two jumper bores were put down for the late Hon. Henry Jordan at Tygum, on the west bank of the Logan, opposite Waterford, the first of which, according to Mr. Strachan, who supervised the operations, was in portion 22, and being in the schists was discontinued at 50 ft. The second bore was in portion 25, and, from the record kept by Mr. Strachan, attained a depth of 230 ft. after passing through alternating beds of shale and sandstone, and at 37 ft. a 6-in. band of "very hard coal," the bottom being in a hard blue sandstone.

On the surface of the ground near the bore are numerous fragments of silicified wood, which is of frequent occurrence in this district, close to the boundary of the schists. A small sandstone quarry in the same portion was used to obtain stone for the foundations of the old Tygum sugar mill. Some blocks lying on the ground appear to have stood the weathering fairly well. Owing to the abundance of better stone nearer the city there seems, however, little prospect of this ever being used for other than purely local purposes.

In his 1887 report, Mr. Rands gives the record kept by Mr. Falconer, of a bore 291 ft. deep, said to have been the first ever made

with a calyx drill, on the property of Mr. Jas. Downman (portion 63). This record gives four seams of coal—

4 feet at 160 feet
4 feet 1 inch at 190 feet
5 feet 3 inches at 269 feet
7 feet 11 inches (including 8 inches of band) at 278 feet.

A sample of the bottom seam was analysed by the late Sir A. C. Gregory, and gave—

Fixed carbon	58·5
Volatile in coking	22·5
Ash	19·0

This account differs in some details from a record, to a depth of 200 ft., signed by F. H. Davis (the inventor of the calyx drill) and John Kirkman, and from a section of the bore drawn by John Falconer, the chief divergence being in the 4-ft. seam at 160 ft., which is not mentioned in the other record, and only a small seam indicated on Mr. Falconer's section. It is unfortunate that, though cores of the harder rocks passed through were obtained, the coal itself was only brought up in fragments, and excepting the one sample analysed, was not preserved for examination.

To prove the coal seams found by the bore a shaft was afterwards sunk in portion 64, about 400 ft. to the S.S.W., reaching ultimately a depth of 253 ft., when, owing to trouble with water, as well as for other reasons, the work was stopped. The following record was measured subsequently:—

RECORD OF SHAFT AT MONA PARK.

	Thickness. ft. in.	Depth. ft. in.
To bottom of timber	97 0	97 0
Blue slate and coaly stone	12 0	109 0
Sandstone	7 0	116 0
Very light shale	1 8	117 8
Sandstone	5 0	122 8
Slate	12 0	134 8
Coal	1 4	136 0
Slate sandstone	20 0	156 0
Sandstone	9 0	165 0
Light slate	10 0	175 0
Blue slate	10 0	185 0
Black and white shale	5 0	190 0
Light slate	2 0	192 0
Black shale	14 0	206 0

Dip of strata, 1 in 9 to S.W. or W.S.W.

Recently (1908) the Mona Park Coal Syndicate, assisted by a Government grant of £100, put down two bores (diamond drill) in a line with, and on either side of, the old bore. The first of these was 360 ft. to the south of the calyx bore, and about 250 ft. east of the shaft, while the second bore was 185 ft. to the north of the old bore. It will be seen from the records that nothing approaching the seams recorded in the former bore were met with, and that the second bore

passed into the underlying schists at a depth of about 490 ft. after having gone through 27 ft. of what appears to be the volcanic tuff lying at the base of the Ipswich beds near Brisbane, and noticed above at Loganlea. This is separated from the schists in the bore by 20 ft. of shale.

The general appearance of the cores from the two bores is the same, though only one bed could be identified with certainty in both —the conglomerate or breccia at 346 ft. in the first bore, and 316 in the second. This consists of angular and rounded fragments embedded in a fine dark-grey base containing streaks of coal—the whole with the appearance of a flow structure. Portions only of these records (from measurements by H. Walker) being available, the remaining measurements were taken from the cores as they lie on the ground, and which, being somewhat weathered, could only be measured roughly.

No. 1 Diamond Drill Bore, Mona Park Coal Syndicate.

(*Measurements to a depth of 332 ft., by H. Walker.*)

	Thickness. ft.	in.	Depth. ft.	in.
Surface alluvial, sandstone, &c.	62	0	62	0
Fine sandstone	5	0	67	0
Coarse sandstone	9	6	76	6
Shaley sandstone	3	6	80	0
Sandstone grit	3	0	83	0
Coal (poor quality)	0	3	83	3
Shale (light coloured)	1	0	84	3
Fireclay	1	3	85	6
Shale	0	6	86	0
Coal (hard clean)	0	3	86	3
Shale (dark)	3	9	90	0
Shale	7	8	97	8
Shale	6	10	104	6
Sand (soft washed out)	0	6	105	0
Shale (dark)	7	0	112	0
Fairly coarse sandstone	7	0	119	0
Sandstone	0	6	119	6
Shale (dark) cleavage dip 1 in 8	0	4	119	10
Sandstone	0	2	120	0
Shale (dark) with two sandstone patches ...	15	8	135	8
Sandstone with shale bands, dip 1 in 4	1	0	136	8
Shale (dark)	3	4	140	0
Shale (dark)	5	0	145	0
Sandstone with shale bands	1	0	146	0
Shale (dark) dip 1 in 4 fairly clear	5	0	151	0
Shale with sandstone bands	17	0	168	0
Sandstone	1	0	169	0
Shale	0	6	169	6
Sandstone	3	6	173	0
Shale with sandstone bands	7	0	180	0
Coal (poor)	0	3	180	3
Fireclay	0	3	180	6
Shale with sandstone bands	21	6	202	0
Sandstone	2	4	204	4
Shale	8	2	212	6
Coal (poor)	0	3	212	9

No. 1 Diamond Drill Bore, Mona Park Coal Syndicate—*continued.*

	Thickness. ft. in.	Depth. ft. in.
Shale	1 3	214 0
Coal	0 3	214 5
Shale	39 7	254 0
Fireclay	1 0	255 0
Shale	3 6	258 6
Sandstone	3 4	261 10
Shale	2 6	264 4
Sandstone	2 2	266 6
Shale	18 0	284 6
Fireclay	1 0	285 6
Shale with coal faces	14 6	300 0
Coal (poor)	1 0	301 0
Shale	2 0	303 0
Coal (poor)	0 3	303 3
Shale	1 9	305 0
Coal (poor)	0 2	305 2
Sandstone with fireclay band	0 4	305 6
Coal (good, with a band)	0 5	305 11
Shale with coal bands	1 7	307 6
Shale, shale with sandstone bands and sandstone	13 3	320 9
Coal (poor)	0 3	321 0
Fireclay	0 6	321 6
Shale	0 6	322 0
Fireclay	0 3	322 3
Shale	6 3	328 6
Sandstone with shale bands	3 6	332 0
———	4 0	336 0
Shale	8 0	344 0
Conglomerate	2 9	346 9
Shale (dark)	3 0	349 0
Shale	7 0	356 0
Shale (mostly dark)	7 0	363 0

No. 2 Diamond Drill Bore, Mona Park Coal Syndicate.

(*Measurements to 191 ft. 6 in., by H. Walker.*)

	Thickness. ft. in.	Depth. ft. in.
Surface (clay, sand, and gravel beds)	91 0	91 0
Hard boulders, coarse gravel	5 0	96 0
Clay and shale	6 0	102 0
Shale	8 0	110 0
Coal bands and shale	0 3	110 3
Shale	7 9	118 0
Sandstone	0 9	118 9
Shale	1 9	120 6
Sandstone with bands of shale	5 4	125 10
Shale	5 0	130 10
Sandstone	0 8	131 6
Shale with bands of sandstone	2 10	134 4
Sandstone	1 8	136 0
Shale with sandstone bands	5 6	141 6
Sandstone	0 6	142 0
Shale with small sandstone bands	9 0	151 0

No. 2 Diamond Drill Bore, Mona Park Coal Syndicate—*continued.*

	Thickness. ft.	in.		Depth. ft.	in.
Sandstone with small shale bands	2	3	...	153	3
Shale	10	3	...	163	6
Shale	3	3	...	166	9
Shale with coal bands	0	4	...	167	1
Shale with sandstone bands	2	0	...	169	1
Sandstone with shale bands	0	10	...	169	11
Shale	1	0	...	170	11
Sandstone (hard)	0	4	...	171	3
Shale	1	6	...	172	9
Fireclay	0	4	...	173	1
Shale	2	0	...	175	1
Coal and fireclay in bands	4	0	...	179	1
Shale	2	0	...	181	1
Shale	5	8	...	186	9
Sandstone	1	0	...	187	9
Shale	4	3	...	191	6
Shale (light grey)	13	0 (?)	...	204	6
Shale (hard grey) with thin sandstone	8	0	...	212	6
Shale (soft)	0	6	...	213	0
Shale (light grey sandy)	5	6	...	218	6
Shale (dark)	5	6	...	224	0
Shale (light sandy)	12	0	...	236	0
Shale (dark)	1	0	...	237	0
Sandstone, carbonaceous	1	0	...	238	0
Shale (dark and light)	8	2	...	246	2
Shale (light grey)	1	6	...	247	8
Shale (black) with coal	3	0	...	250	8
Light and dark shale	21	0 (?)	...	271	8
———	2	0	...	273	8
Shale (dark and light)	4	0	...	277	8
Shale (light)	0	3	...	277	11
Shale (*dark*) *with coal*	0	10	...	278	9
Shales (mostly dark)	35	6	...	314	3
Conglomerate	2	6	...	316	9
Shale with thin sandstone	13	0	...	329	9
Shale (light)	1	6	...	331	3
Shale (dark)	5	0	...	336	3
Shale (light)	3	9	...	340	0
Shale (mostly dark)	20	0	...	360	0
Shale (dark)	29	4 (?)	...	389	4
Sandstone (dark)	0	8	...	390	0
Black shale with coal	1	0	...	391	0
Shale	30	0	...	421	0
Sandstone	5	6	...	426	6
———	1	0	...	427	6
Shale	1	0	...	428	6
Sandstone	2	4	...	430	10
Shale (light)	1	8	...	432	6
Sandstone	1	6	...	434	0
Shale	9	0	...	443	0
Tuff	27	6 (?)	...	470	6
Shale	20	0 (?)	...	490	6
Schists	to bottom.				

Some 200 or 300 ft. west of the shaft the overlying sandstones

ESCARPMENT OF BUNDANBA SANDSTONE.

NEAR "MONA PARK."

outcrop along a low ridge, and further north form a well-marked escarpment where the beds are inclined at an angle of 30° to the west. At the back of this ridge, where the beds are but slightly inclined, Chambers Creek has cut through the sandstone and exposed the shales.

Mr. Downman was strongly of the opinion that the strata found in the later boring are dissimilar to those met with both in the calyx bore and the shaft. In confirmation of this view, which otherwise appeared so improbable, it is remarkable that a fragment from the old bore is of hard and somewhat ferruginous sandstone, similar to what can be seen on the dump of the shaft, and unlike anything cut by the diamond drill. In order to test this and settle the question definitely, Mr. Downman has since, with the assistance of a grant of £100 from the Government, put another bore down, 200 ft. west of the shaft. This bore, allowing for the rise of the surface and the dip of the strata, as well as the avoidance of some 35 ft. of alluvium passed through by the shaft, has proved 100 ft. of strata hitherto untested. It was expected, if the calyx record proved correct, to cut through the seams pierced by that bore at less than 400 ft., while, on the other hand, if the strata were identical with those pierced by the previous diamond drilling, to cut the bed of conglomerate—the only stratum identifiable with certainty—at about 400 ft. As neither of these contingencies had happened at that depth, the hole was bored a further 50 ft. At 420-426 ft. two beds, separated by a little shale, were cut through, which, though very different from the conglomerate in the other bores, are probably a finer-grained variation of the same bed. It is remarkable, however, that both the texture and thickness should have varied so greatly, since in the other two bores there was only a difference of 3 in. in thickness, and the material appeared identical.

Many of the other strata, however, agree roughly in their position with the beds cut by the previous work, and leave little doubt as to their identity. It is noteworthy that the 16-in. seam in the shaft, the occurrence and thickness of which are beyond doubt, has become reduced to 6 in. in a distance of 200 ft., and that, while such beds as appear to be recognisable in the various sections vary considerably in thickness, some which are cut in one do not appear in the others. While the thin seams of coal and black shales cut in the diamond drill bores correspond, to a certain extent, in their position with the seams recorded from the calyx, certainly nothing has been found which could have been mistaken for such splendid seams or to have yielded in quantity only 19 per cent. of ash. Whatever explanation may be suggested in respect to the record of the calyx bore, there can be no doubt that the coal measures have now been proved in this locality through their whole thickness (500 ft. from the bottom of the sandstone), and do not contain any seam of workable thickness.

The following is from the record of the latest (1909) bore, kept by the foreman of the drill:—

	Thickness. ft.	in.		Depth. ft.	in.
Sandstone	46	0	...	46	0
Conglomerate and sandstone	42	0	...	88	0
Shale	12	0	...	100	0
Conglomerate	18	0	...	118	0
Shale and sandstone	25	0	...	143	0
Shale, 6 in. fireclay	8	0	...	151	0
Sandstone	10	0	...	161	0
Sandstone and shale	11	0	...	172	0
Shale	12	0	...	184	0
Shale with *6 in. coal*	11	0	...	195	0
Shale and sandstone	23	0	...	218	0
Shale	22	0	...	240	0
Shale and sandstone	12	0	...	252	0
Shale and hard sandstone	10	0	...	262	0
Shale	11	0	...	273	0
Shale and sandstone	9	0	...	282	0
Shale and sandstone *and dirty coal*	13	0	...	295	0
Shale	10	0	...	305	0
Shale and sandstone	22	0	...	327	0
Shale, 6 in. fireclay	11	0	...	338	0
Shale, sandstone, 3 in. fireclay	12	0	...	350	0
Shale, 3 in. fireclay	9	0	...	359	0
Dirty *coaly shale*	4	0	...	363	0
Shale, fireclay, with traces of coal	37	0	...	400	0
2 ft. sandstone, 6 in. shale, 6 ft. fireclay ...	3	0	...	403	0
Shale, 6 in. fireclay at 414 ft.	18	0	...	421	0
Sandstone (conglomerate of other bores? E.O.M.)	5	0	...	426	0
Shale	4	0	...	430	0
Fireclay, *6 in. coal at 436 ft.*, bands of sandstone	10	0	...	440	0
Fireclay with alternate bands of shale and sandstone	10	0	...	450	0

In the steep western bank of the Logan River, in portions 56 and 57, can be seen carbonaceous shales, and Mr. Rands mentions that a seam of coal, 15 in. thick, was reported to have been here met with in a tunnel, which is now no longer visible. A little further up the river on the opposite side, in portion 287, the schists are seen in the bank, which further up again is composed of black shale with thin coal, a section in the small reserve opposite Mr. Downman's showing coal up to 6 in. thick. The dip here is slight and to the E.N.E., or the reverse of that in the shaft on the other side of the river. Half a mile north of Buccan Station, between the road and the railway, is the site of a bore which Mr. Rands, in his 1889 report, says was 350 ft. deep, the schists being struck in the bottom without

having passed through any thick seam of coal. The following record of a "coal bore near Buccan," obtained from the Mona Park Coal Syndicate, is doubtless that of the bore in question:—

COAL BORE NEAR BUCCAN.

	Thickness. ft.	in.		Depth. ft.	in.
Clay	18	0	...	18	0
Decomposed coal with layers of black shale ...	14	6	...	32	6
Black shale and coal veins	7	6	...	40	0
Black shale and fossiliferous clay	6	6	...	46	6
Black shale	4	6	...	51	0
Coal	0	5	...	51	5
Black shale	8	7	...	60	0
Black shale and fireclay	5	0	...	65	0
Black shale and coal veins	15	0	...	80	0
Fireclay	1	0	...	81	0
Fireclay and black shale	12	0	...	93	0
Coal	0	6	...	93	6
Black shale and fireclay	6	6	...	100	0
Bands of light and dark shale with coal veins	4	0	...	104	0
Calcareous limestone	0	4	...	104	4
Light shales (hard)	2	8	...	107	0
Fireclay and coal veins	3	0	...	110	0
Hard black shale and coal veins	4	0	...	114	0
Ditto	11	0	...	125	0
Black shales and fireclay	2	0	...	127	0
Coarse sandstone	0	3	...	127	3
Black shale and clay	6	9	...	134	0
Clay and shale	4	9	...	138	9
Hard coal	0	3	...	139	0
Shale and coal veins	2	0	...	141	0
Black shale and clay	31	6	...	172	6
Shale and sandstone	8	6	...	181	0
Good hard coal	1	0	...	182	0
Shale	9	0	...	191	0
Coarse grey sandstone	2	6	...	193	6
Fine white sandstone	3	6	...	197	0
Very hard sandstone	3	3	...	200	3
Hard black shales	1	3	...	201	6
Light sandstone	6	0	...	207	6
Light hard kennel	3	6	...	211	0
Blue kennel	9	0	...	220	0
Hard sandstone	6	6	...	226	6
Hard milgrit	1	6	...	228	0
Hard sandstone	22	0	...	250	0
Hard blue shale	4	0	...	254	0
Black blare	0	6	...	254	6
Hard blue shale	11	6	...	266	0
Light shale	4	0	...	270	0
Blue shale	4	0	...	274	0
Black shale	0	5½	...	274	5½

Coal Bore near Buccan—*continued.*

	Thickness.		Depth.	
	ft.	in.	ft.	in.
Hard bright coal	0	0½ ...	274	6
Calcareous limestone	0	4 ...	274	10
Shale and sandstone, with coal veins	25	2 ...	300	0
Brown shale	7	0 ...	307	0
Light shale	2	0 ...	309	0
Green sandstone	1	6 ...	310	6
Fossiliferous shale	4	0 ...	314	6
Black shale with coal veins	1	0 ...	315	6
Light shale	1	8 ...	317	2
Hard blue shale	3	10 ...	321	0
Shale	15	0 ...	336	0
Sandstone and shale	8	0 ...	344	0
Hard sandstone	1	0 ...	345	0
Cemented quartz pebbles	0	6 ...	345	6
Solid quartz	1	6 ...	347	0

This record shows four thin seams of coal, of which one—at 182 ft.—was 1 ft. thick.

It is to be noted that the volcanic tuff found in the second bore of the Mona Park Coal Syndicate is absent here, unless perhaps it was not recognised as such and is included as the 15 ft. of shale at 336 ft. It is also to be observed, however, that no mention is made of the conglomerate, which from its peculiar appearance would certainly have been recorded had it been present.

The bore is said to have been put down with a calyx drill.

Close to the railway, and near the site of the bore, a shaft was sunk about 15 years ago, and is said to have been 75 ft. deep. The material left on the surface consists of black shale containing streaks of coal. In portion 261 is another shaft, which, in his 1887 report, Mr. Rands states was 40 ft. deep, when a seam of coal was struck. The two men who were sinking it were suffocated by foul air, and after this fatality no further sinking was done. These two shafts and the bore are within half a mile of the boundary of the schists. The coarse conglomerates to the east of this probably form locally the base of the system.

The escarpment of the Bundanba sandstones seen at Mr. Downman's is continued across the river, to the south of Buccan Station, but becomes less pronounced, reappearing, however, at intervals, until three or four miles south-east of Logan Village, where it is higher and more precipitous than in any other locality observed. At the back of the escarpment a gully in portion 11 has cut through the sandstones and exposed the coal measures. It was here that Mr. Alex. Watt did some prospecting work many years ago, as described

by Mr. Rands, who in his two reports states that a shaft in the gully was 47 ft. deep, cutting a seam of cannel coal 1 ft. thick, and another seam of coal 15 in. thick, a piece of which gave on analysis:—

Moisture	1·32
Volatile hydrocarbon	19·71
Fixed carbon	47·37
Ash	31·61

At the head of the gully immediately underneath the sandstone which overlies it conformably is a seam of coal, on which a tunnel was driven by Mr. Watt. Mr. Rands reports: "The seam is 3 ft. 3½ in. thick, including seven bands. Unless these bands, which are distributed throughout the seam, thin out, the coal will be of no commercial value"; and gives the following analysis:—

Moisture	2·2
Volatile hydrocarbon	22·8
Fixed carbon	51·0
Ash	24·0

The strata dip 8° to the south-south-west. In portion 15A soft schists can be seen in the bottoms of the watercourses, on following up which carbonaceous shales, to a thickness perhaps of 150 ft., are met with, and above these the bold escarpment of sandstone. Southward of this locality the sandstone can only be seen outcropping at intervals, and appears to follow closely the boundary of the schists, being probably in places in contact with them. The country to the west of the boundary is all of a very sandy nature, and leaves little doubt about what is beneath the soil.

In portion 12v shales are exposed in a branch of Sandy Creek, dipping to the west-south-west, under a low escarpment of sandstone. In portion 18v black and coaly shale is seen in the gullies running westwards, and appears to be interbedded with hard massive sandstone. It is certainly overlain by the sandstone which forms the top of portion of the ridge separating Cedar Creek here from the gullies running into Sandy Creek, the shales being visible on the Cedar Creek side of the ridge also. The shale and sandstone in the gully are faulted.

To the south of this the schists and Trias Jura are covered by the basalt of Tamborine Mountain, close to which the actual boundary line is not easy to determine, though probably it lies close to, if not coincident with, Cedar Creek.

In portion 356, 3½ miles south of Logan Village, and at some distance from the outcrop of the coal measures, a bore was put down to a depth of 250 ft., which Messrs. Stafford Bros., who kindly supply the information, state passed principally through sandstone, without meeting any encouraging prospects.

From the above account of the various occurrences of coal and the prospecting operations that have taken place in the Kingston-

Logan Village Area of coal measures, it will be seen that it is only in the neighbourhood of Buccan, on both sides of the river, that work has been done which affords any information as to the existence or otherwise of coal seams of a workable thickness. Throughout the area there is abundant evidence of the coal-bearing possibilities of the measures, a systematic testing of which offers considerable inducements to the prospector, the greater part of the area being conveniently situated either for rail or water carriage. The promiscuous sinking of shafts or bores to shallow depths, however, holds out but slight prospects of success, and yields little or no information of use in the prosecution of further work. That there are numerous thin seams of coal has been proved, and any of these might either develop to a workable thickness or thin out altogether at no great distance. The seam of coal immediately under the sandstone at Mr. Watts's does not appear to be represented at all in the boring at Mr. Downman's—a distance of 4½ miles in a straight line—so that while the negative result of the boring is certainly very disappointing, the result can in no way be held to apply to strata not in the immediate vicinity. Moreover, the boring shows that the strata were laid down under frequently changing conditions, and at times in strong currents of water. These conditions may have been due to the proximity of the coast line, and it is not unlikely that, further from the schists, or in other localities within the outcrop of the coal measures, the process of sedimentation will be found to have been less fitful and more favourable for the deposition of thick seams of coal.

In reference to the irregular boundary between the Gympie formation and the Trias Jura, it has already been pointed out that the latter has been laid down on a very uneven floor, and an examination of the system shows that in many places the higher members of it overlap the lower and lie directly upon the schists. This relation, which is observed between the barren sandstone series and the coal measures, and which presumably exists between the various strata of the coal measures themselves, is of great importance in regard to the probability—or rather certainty—of future prospecting operations; for it leaves it a matter of some doubt whether upon passing through the coal measures into the schists the measures have been prospected to their very base.

The occurrence of the volcanic tuff in the bore at Mona Park, and also on the surface at Loganlea, is thus of more than mere geological interest, for the tuff is known near Brisbane to be at or near the base of the coal measures, and it now seems probable that it extends beneath the system over the whole area between Logan Village and Brisbane. If this is the case, its absence from a bore passing into the schists would lead to the supposition that the whole thickness of the measures had not been passed through, while its presence would make it certain that they had. These considerations,

though applied more particularly to the Kingston-Logan Village area, are applicable also to the other areas, and should not be lost sight of in interpreting the results of future operations.

2.—Coal Measures at the Mouth of the Logan River.

In his 1889 report Mr. Rands states that coal was met with in a bore on the property of Mr. W. H. Couldery, in selection No. 2. The country here is alluvial, with the exception of two low ridges of sandstone. The north bank of the river is all schists, and these two ridges are only surface indication that the rocks covered by alluvium on the south side of the river differ from those on the north or to the west.

3.—Coal Measures of the Broadwater-Tingalpa Creek Area.

The coal measures of this area, as indicated by the fireclay, carbonaceous shale, and sometimes thin coal exposed in the roads and watercourses extend from the eastern side of Mount Gravatt across the Broadwater (as Bulimba Creek is here known) to Tingalpa Creek. Limited to the north by the schists, it is the southern or upward boundary which presents a considerable amount of uncertainty in the mapping. Comment has already been made on the difficulty of distinguishing between the divisions of the Trias Jura system, and nowhere does this present greater uncertainty than in the area now under consideration. The boundary marked on the map must be considered as indicating the probable limits of the coal measures, accuracy in mapping which will only be attained by actual prospecting. Thick sandstone, however, can be seen on the old Ipswich-Cleveland road, between the Logan road and Broadwater, and on the eastern side of the creek, in portion 338, the country is high and sandy, similar to that which in other places is due to the Bundamba sandstones, thus fixing the boundary approximately in the locality.

Coal was washed out of the waterholes above Broadwater Bridge by a flood many years ago, and this discovery gave rise to a certain amount of prospecting work. Nothing, however, of a serious nature appears to have been attempted, or, if such was the case, there is no record of it now. Shafts are said to have been sunk in portions 321 and 354, and a bore put down in portion 352, but no information can be got either as to their depth or the strata passed through.

In portion 319 is an old shaft which is referred to by Dr. Jack in his Annual Progress Report for 1896, as being perhaps 20 ft. deep, the surrounding débris being coaly shale and ferruginous sandstone. He further states that in portion 266 a shaft, 35 ft. deep, was sunk in 1891 in black carbonaceous shale, with an 18 in. seam of impure coal, and that a well, 50 ft. deep, was sunk through ferruginous

shales and thin beds of black clay band ironstone.; also in portion 267, in a shaft 40 ft. deep, a seam of coal 9 in. thick was obtained at a depth of 18 ft.

At the present time there is very little to indicate that the shafts went through carbonaceous strata, though in the road between portions 267 and 268 is a section of fireclay and carbonaceous shale. The steep northern bank of the creek to the north of this is formed of the tuff which occupies the narrow valley through which the creek runs, the high ground on either side being formed of schists, seen also in the bank of the creek in portion 308. In the road near portion 259 is a section of fireclay and shale, showing a slight syncline.

South-east of Mount Petrie, in portion 357, Tingalpa, black and coaly shale is exposed in the gullies, near one of which a shaft was sunk by the late Hon. J. C. Heussler, M.L.C., who informed Dr. Jack* from memory that "the shaft was either some 80 or 120 ft. deep, and then for further search a bore was employed. Several small seams of coal, from 4 to 9 in. thick, were met with at various depths —to begin with, at about 40 ft. The rock consists of layers of clay, cement, gravel, sandstones, shales, &c.; in the latter some very complete fossilised ferns were found. The work was discontinued on account of expense." In the gully near the shaft is a tunnel, which has fallen in.

Near the western boundary of this portion, and close to the schists, the watercourses show, besides black shale, a coarse conglomerate composed largely of angular and sub-angular fragments of quartzite.

Immediately to the east of portion 357 the only rock visible is a rather soft sandstone, beneath which, in the bank of a large waterhole between portions 344 and 345, is some black shale, containing 1 in. or 2 in. seams of coal. The strata are nearly horizontal. Bores were put down close to the waterhole, as well as in other places, but, unfortunately, no information could be obtained about them. Schists are exposed over a length of 300 or 400 yards in the bed of Tingalpa Creek, but cannot be seen out of the creek bed, the next rocks visible down the creek being a pebbly conglomerate and sandstone.

In portion 343 is a shaft, said to be 70 ft. deep, which was sunk a few years ago by the men who did the boring already referred to. Black shale, containing streaks of coal, constitutes the débris brought up. Black shale with thin coal dipping to the south-west is cut by the creek near the shaft, and a little higher up is covered by sandstone similar to that in portion 345. The dip here is 1 in 10 to the south-east. On the opposite side of the creek, in portion 101, is an old shaft, said to have been sunk over 40 years ago. Coal, or coaly shale, is showing also further up the creek, between portions

* Annual Progress Report, 1897.

103, Capalaba, and 342, Tingalpa; and, though the strata, as far as could be seen, are undisturbed, the shale has a very crushed appearance in the hand. A sample of this, taken by Mr. L. C. Ball,* gave the following analysis (Government Analyst):—

Moisture	8·39
Volatile hydrocarbons	20·72
Fixed carbon	33·05
Ash (very light brown)	37·84

The coal does not cake, coke, nor intumesce.

The north bank here is a ridge of coarse conglomerate continuous with that previously mentioned lower down the creek. From here the conglomerate and sandstone can be traced in a practically straight line north-west to near Hemmant, only broken where crossed by the watercourses; over the whole length it forms a low ridge in what is otherwise flat country. East of Tingalpa Creek it can be recognised where it crosses the road between portions 115 and 119, but cannot be traced further.

The conglomerate on the ridge east of Tingalpa Creek is made up largely of fragments of schist, as well as of the harder quartz or quartzite, the fragments of which are often but slightly water worn.

A similar conglomerate occurs also nearer to Cleveland, where in one place it is composed entirely of soft schist. Specks of gold were found in the quartz fragments from this rock near Hilliard's Creek, and even gave rise to some prospecting for the precious metal.† Where the schist fragments form a large proportion, the weathered rock has usually a very ferruginous appearance, and the quartz, or quartzite, shows little or no sign of being water worn. A similar rock on the shore south of Manly is over carbonaceous shales.

Whether this conglomerate and the sandstone forming the same ridge towards Hemmant are the local equivalent of the Bundanba sandstones natural sections are far too few to determine; as, however, coal-bearing strata have not been observed beyond this, it forms a convenient tentative boundary to the coal measures, and not improbably the correct one.

Near the corner of portion 117, Parish of Capalaba, some slightly carbonaceous strata passed through in a well may possibly belong to the coal measures; it is close to an outcrop of the conglomerate.

The occurrence of the coal measures in this area close to the boundary of the schists, as well as the association with the volcanic tuff, can leave no doubt as to their belonging to the Ipswich or Lower measures; this area is, moreover, continuous with the coastal area, and is on this account of particular interest, for it forms the

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* "Queensland Government Mining Journal," Nov., 1907.

† R. L. Jack, Annual Progress Report, 1895.

connecting link, two and a-half miles wide, between the inland Trias Jura and the coastal belt of that formation, which stretches from here northwards beyond Bundaberg.

Though little has been done to test this area of coal measures, and little can be seen on the surface, the knowledge that the strata are on the same horizon as the Ipswich Coalfield should render this as well as the other areas worth prospecting. Though mostly within a ten-miles radius of Brisbane, it is not, however, very favourably situated as regards railway transit.

4.—Coal Measures of the Coastal Area.

While the coal measures in this area are continuous with those last described, and present no marked geological difference from the other areas of the Ipswich coal measures, they differ in the fact that they occur on the eastern, or coastal, side of the outcrop of the Palæozoic rocks on which they have been laid down. As in the other areas, they are associated at their base with the volcanic tuff, and are overlain also by a thick series of barren sandstone. The nature of the coal found, so far, is characteristic also of the same measures in other parts, and there appears to be no reason to conclude that the conditions of sedimentation differed to any great extent from those prevailing on the western side of the schists. Over the greater part of the area between the Palæozoic rocks and Moreton Bay, and within the limits of this report, the paucity of outcrops renders the information obtainable from the surface scanty and indefinite, and gives to the mapping a corresponding amount of uncertainty. That the measures are, however, overlain by a considerable thickness of practically barren sandy strata is rendered certain by the Lindum Mere bore, and, more recently, by the bore at Toorbul Point, some distance north of the present map.

In his Annual Progress Report for the year 1895, Dr. Jack gives the following record of the strata met with in a well sunk in portion 50, Parish of Tingalpa (mistaken by him for portion 92). The well is sunk in a clay quarry, the property of Mr. Kelly, who gave Dr. Jack the information :—

	Ft.	in.
Dark brown shale	22	0
Black shale	20	0
Coal	1	6
Shale	0	6
Coal	1	6
Black shale	7	6
Sandstone	4	0
Hard glossy black shale	20	0

Above this in the clay quarry was—

	Ft.	in.
White shaley fireclay	20	0
Ironstone bands and brown shale	3	0

which makes the total 100 ft.

DISTURBED STRATA, KELLY'S CLAY PIT.

The strata in the southern face of the quarry at the present time are severely folded and dislocated, several other faults being visible, notably one in the north-east of the pit, near the well. This latter fault appears to dip in an easterly direction, the strata above the fault having a south-east dip of 1 in 8, while below the fault the inclination is much slighter and to the north-east. Mr. Kelly states that a considerable quantity of coal was obtained from the bottom of the quarry, but it was not more than 18 in. in thickness, and appeared to thin out to the western side of the quarry.

At the present time some prospecting operations are in progress, a shaft having been sunk about 80 ft. to the east of the well, and a bore put down from the bottom of the shaft, but the proprietor, who gave all information as to the strata met with, and invited inspection, desired that the information obtained should not be made public, at any rate for the present.

In portion 51, about 15 chains south-west of the clay quarry, is the site of a bore, which Mr. Kelly states was 200 ft. deep and entirely through a loose sandstone. This was recorded as being 150 ft. deep by Dr. Jack, who remarks on the dissimilarity of the strata in the bore and well, and points out the probable existence of a fault between them. The probability amounts to a certainty when the almost horizontal beds on the western side of the quarry are considered in conjunction with the severe faulting there displayed.

In portion 14, to the north of Murarrie Railway Station, is an old shaft, which Dr. Jack* records as showing fragments of coal. At the present time no trace of coal could be found on the dump, which consists of sandstone. In the road to the west of the shaft sandstone and shale appear to dip in various directions within a short distance, due presumably to some disturbance of the strata; it is interesting to note, though possibly only a mere coincidence, that in a line with this and the disturbance at Kelly's, a faulting and folding of the strata (carbonaceous shale) occurs in a cutting on the Lytton road.

Shales are seen in several places on this road to the north of Murarrie, and in portion 16 is an old shaft, which Dr. Jack states was said to have been 70 ft. deep, and to have passed through several seams of coal, one of which was 6 ft. thick, but impure. Coal and coaly shale can still be seen amongst the débris on the surface.

In portion 17 the Queensport Meatworks are situated in the old stone quarries referred to by Stutchbury. The quarries were opened for sandstone, beneath which carbonaceous shales and thin coal have been exposed. In sinking a posthole at the works recently, some coal was found, which proved, in a hole sunk for the purpose, to be

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* Annual Progress Report, 1897.

14 in. thick. From the bottom of this hole (about 14 ft. deep) a bore was put in a further 36 ft., making a total of 50 ft. The hand-drill, though rotary, did not fetch up a core, and consequently a reliable sample of the strata was not obtained. The total section, however, would roughly have the following measurements:—

	Ft.	in.
Sandstone		
Shale and fireclay	20	0
Coal (1)	1	2
Shale and clay	14	0
Coal (?) (2)	1	4
Clay	1	9
Dark shale	1	5
Coal (3)	1	7
Shale and clay, say	27	9
	69	0

An analysis of the top seam (1) gave the following (Government Analyst):—

Moisture	9·2
Volatile hydrocarbons	21·3
Fixed carbon	43·5
Ash	26·0
	100·0

Rough analyses of the material, brought up by the drill from the other two seams, and which may not be a reliable sample, gave the following:—

Moisture	2·3	2·0
Volatile hydrocarbon	19·7	23·5
Fixed carbon	33·5	44·7
Ash	44·5	29·8
	100·0	100·0

While none of these seams are of commercial value, they certainly offer considerable encouragement to further search.

A 2-ft. seam—probably one of those in the above section—is said to have been met with at a depth of 40 ft. in a well on the eastern side of the works. An inspection of the levels at which the sandstone in the works is seen on the side of the hill shows that the strata must be faulted down to the west, though probably only a few feet. It further shows that there is a considerable area between the river and the main road which is probably undisturbed by any serious faulting. A quarry on the hill to the east of the works shows the beds dipping at 30 deg. to the north, the dip in the works is very slight—to the north 10 deg. east.

In portions 18 and 19 carbonaceous shale forms the river bank, which shows at least one small fault. In 19 a tunnel was many years ago driven in the bank, and a 2-ft. seam of coal is said to have been worked. Information about it is very meagre, and some descrip-

tions say that even the 2 ft. of coal was very dirty. The mouth of the tunnel has now fallen in, preventing inspection. In portion 19 an old disused clay pit shows a section of fireclays and carbonaceous shales similar to those in Kelly's clay pit, the dip being 12 deg. to the north. South of the clay pit a shaft has, near the surface, passed through hard clay shale, and lower down, to judge by the débris, through carbonaceous strata. Whether this shaft was in connection with the old workings from the river bank is not now known.

Though a considerable amount of work appears to have been done in this locality, not without encouraging results, no attempt seems ever to have been made to test the ground to a depth; if such had been done, it would certainly have been known, even though the actual record might not have been kept.

In the railway cutting near Hemmant Station the strata, consisting of sandstone and one bed of shale, dip at an angle of 75 deg. to the east; and in a road about half a mile south of the station an outcrop of sandstone appears also to be highly inclined to east 10 deg. north. On the same ridge as the latter a well, in portion 35, appears to have passed through white and black shale as well as sandstone. This ridge is the continuation of that referred to in dealing with the Broadwater-Tingalpa Creek area, and which can be traced in an approximately straight line for a distance of some eight miles. Though the low hill cut through by the railway at Hemmant is not actually continuous with this, it is evidently part of the same line here seen to be due to a sharp folding, probably accompanied by faulting.

Followed to the south-east the sandstone on the surface of the ridge becomes coarser, but no sections can be seen showing the inclination of the strata. The remarkably straight line of outcrop probably signifies either a high angle of inclination or perhaps a fault.

East of this outcrop the country is flat, covered in parts by basalt. In the neighbourhood of Wynnum and Manly, however, two or three sections can be seen showing carbonaceous shale and conglomerate, notably in a quarry north of Manly Station, where the beds are dipping at 25 deg. to the south-west. A fault is showing in the quarry, and in the road some 200 yards east of this the strata are observed dipping at 40 deg. to the west; a few yards further east the dip is 80 deg. to the east, while further east again the dip once more is westward—at 45 deg.

The loose conglomerate in the quarry is composed of pebbles of white quartz, some of which have flat cleavage faces, and is similar to a conglomerate in portion 173, four miles to the south-west.

In portion 129 is the site of the Lindum Mere bore, put down in 1897 to a depth of 1,060 ft. Dr. Jack* gives the following description to a depth of 876 ft. :—"The strata met with consist mainly of sandstones and grits, with occasional bands of dark carbonaceous shale, which in many instances are marked with the impressions of the plants commonly met with in the Ipswich Coalfield, with some coaly streaks. The cores show that the beds had at the surface a dip of 20 deg., but the direction of the dip has not been ascertained. The dip diminishes with the depth of the bore, until the lowest cores show horizontal stratification. This may be accounted for by a synclinal arch in the strata, the axis of which is not vertical." At 876 ft. the drill encountered bands of hard siliceous sandstone. The bore was ultimately continued to 1,060 ft., but Dr. Jack gives no information about the strata cut except that no coal was obtained.

While it is to be regretted that a detailed account of the Lindum bore throughout its whole depth is not available, the above description shows at least 876 ft. of sandy strata bearing only a small proportion of carbonaceous material. As this must be above the coal measures already described, there is little reason to doubt that these beds are the equivalent, or portion thereof, of the Bundanba sandstones of the inland Trias Jura. The dip of the strata at Manly and the association there of a conglomerate, similar to that which presumably is within the coal measures, with carbonaceous shales, leads to the conclusion that the measures have been brought up again to the surface by means of a synclinal fold, as was suggested by Dr. Jack. While sufficient is not showing, perhaps, to determine the question with certainty, it is worth noting that the hills which form the coast line at Wynnum and Manly are roughly parallel to the outcrop of what is probably the other side of the syncline.

North of the Brisbane River, and east of the schists at the Hamilton and Clayfield, the country is all flat, and yields no information as to the rocks beneath. Excepting a little sandstone at Whinstanes, it is devoid of outcrop, and is practically all alluvial ground.

Dr. Jack, in his book, gives a report, by Mr. William McKinnon, of a bore at the Racecourse or Eagle Farm; the following more detailed section of this bore was obtained from the office of the Hydraulic Engineer:—

	Thickness. ft.	in.	Depth. ft.	in.
Clay, yellow	80	0	80	0
Sandstone and clay	10	0	90	0
Sandstone, white	110	0	200	0
Clay, blue	20	0	220	0
Sandstone, with bands of clay	70	0	290	0
Shale, dark, with bands of sandstone and *coal* ...	40	0	330	0
Ditto	60	0	390	0

* Annual Progress Report, 1897.

	Thickness. ft.	in.		Depth. ft.	in.
Shale and sandstone, with layers of *coal* ...	50	0	...	440	0
Shale and sandstone in layers	60	0	...	500	0
Shale, dark	100	0	...	600	0
Shale, light	30	0	...	630	0
Coal in layers intermixed with shale and sandstone, impossible to determine thickness of any seam	45	0	...	675	0
Shale, light coloured	15	0	...	690	0
Shale, gravelly	30	0	...	720	0
Shale and sandstone	26	0	...	746	0
Shale, dark gritty	45	0	...	791	0
Coal	5	0	...	796	0
Shale and sandstone, gritty, with *bands of good coal*	19	0	...	815	0
Shale, carbonaceous, with bands of gravel and coal	20	0	...	835	0
Shale and sandstone, carbonaceous, *with seams of coal*	80	0	...	915	0
Shale, grey and black, carbonaceous	20	0	...	935	0
Shale, grey and white, clay, and sandstone ...	15	0	...	950	0
Shale, grey and black, carbonaceous, with thin bands of coal	26	0	...	976	0
Shale, grey and black, carbonaceous	44	0	...	1,020	0
Clay and sandstone, light coloured	80	0	...	1,100	0
Shale, dark	35	0	...	1,135	0
Shale, with sandstone bands	65	0	...	1,200	0
Shale, grey, and sandstone, various colours ...	49	0	...	1,249	0
Shale, grey	28	0	...	1,277	0
Sandstone	36	0	...	1,313	0
Conglomerate, various colours	34	0	...	1,347	0
Sandstone, conglomerate	84	0	...	1,431	0
Inflammable gas at 1,535 ft.					
Sandstone, soft	129	0	...	1,560	0
Sandstone and clay	120	0	....	1,680	0
Schist to bottom	101	6	...	1,781	6

In Mr. McKinnon's report it is stated that below the 5-ft. or 6-ft. seam of coal "a carbonaceous shale, sandstone, and thinner seams of coal from 6 in. to 3 ft. in thickness, have been passed through down to the depth of 875 ft." Dr. Jack gives an analysis by Mr. Mar, Government Analyst, of the coal from the bore, but it is not stated which seam the coal is from:—

Water	0·65
Coke	64·15
Ash	24·6
Carbon, hydrogen, oxygen, nitrogen, and sulphur	75·4
Specific gravity	1·55

The "ashy sandstone" or tuff was recognised by Mr. H. G. Stokes in the débris from the bore at the base of the coal measures. In considering the section, the fact must not be neglected that the bore was a jumper bore, and that in consequence the size and quality of the coal seams met with are somewhat dubious. It is surprising that no attempt has been made to test them properly.

The record of the bore may be summarised as—

	Thickness.	Depth.
	Ft.	ft.
Alluvium, sandstone, and some clay	290	290
Carbonaceous shales, with sandstone and coal ...	987	1,277
Sandstone, conglomerates (and tuff ?) and clay ...	403	1,680
Schists	to bottom.	

The bed of sandstone over the coaly strata at Queensport has been already mentioned. Sandstone also occurs closer to the schists and presumably under the shales both near Murarrie Station and on the river bank. It appears probable that these two sandstones correspond to those above and below the 987 ft. of carbonaceous beds shown in the bore, in which case the 5-ft. seam at 791 ft. in the bore should be found at a depth of about 500 ft. at Queensport, supposing it extends so far.

Though the bore is only about a mile from their outcrop, the schists were not cut till a depth of 1,680 ft. was reached. Whether this signifies a faulting or is merely the result of the strata having been deposited on a steeply sloping floor, it would probably be desirable that any future boring should take place, at any rate in the first instance, at a greater distance from the boundary, since there would be less likelihood of the strata being disturbed or of the quiet conditions of sedimentation necessary for the deposition of thick seams of coal having been interfered with owing to the proximity to the shore of the lake or other sheet of water in which the sediments were being deposited.

In Messrs. Jas. Campbell and Sons' clay pit at the Albion a considerable thickness of fireclays and shales, dipping at a small angle to the south-east, has been exposed, the section showing a small overthrust fault. Apparently over this shale, and abutting against the schists in a probably faulted junction, is the sandstone of Petrie's quarry, the shaley beds of which, as well as of Campbell's quarry, are richly fossiliferous.

A coarse but loose conglomerate forms the high northern bank of Kedron Brook, about half a mile south-west of Nundah Station. In one or two places carbonaceous material can be seen beneath this conglomerate, and between portions 349 and 350 is the entrance to the Nundah Coal and Gravel Company's mine. Two tunnels have been driven in the bank of the creek, the second of which has penetrated some 400 ft. in a direction a few degrees west of north, the true dip being about 5 deg. east of north. The first tunnel, which was on the true dip, is now only used for ventilation. The tunnels have been driven on a seam of coal which varies in thickness from 3 ft. 6 in. to 4 ft., including several bands. Followed to the east the seam is said to be much thinner, but, as that part of the

NUNDAH COAL AND GRAVEL COMPANY'S COAL MINE.

SURFACE PLANT.

mine is not now accessible, it is impossible to determine whether this is actually the case or that the reduced size is due to a channel in the coal. The following is probably an average section:—

	Inches.
Coal	7
Band	$0\frac{3}{4}$
Coal	10
Band	1
Coal	2
Band	$1\frac{1}{2}$
Coal	11
Band	$0\frac{1}{4}$
Coal	8
	$41\frac{3}{4}$

An analysis of the coal from the above section, excluding the three top bands, gave the following result (Government Analyst):—

	Per cent.
Moisture	1·6
Volatile hydrocarbons	23·7
Fixed carbon	55·2
Ash	19·5
	100·0

Ash is light grey in colour. On heating, the coal intumesced and caked, and gave a coke which was very friable.

Near the mouth of the tunnel a bed of shale, up to 8 ft. in thickness, separates the conglomerate and the coal seam, but some distance in the tunnel the shale thins out, and the coal is directly beneath the conglomerate. The strata, which dip at 1 in 7, are disturbed by a series of faults which strike about east-north-east and west-south-west, the downthrow being to the north-north-west. In the distance of 300 ft. to the present water level there are no less than eight faults, varying from 2 ft. upwards in throw, and giving to the tunnel a general gradient of 1 in 4. Except for the faulting, and its consequent expense and uncertainty, the seam should, owing to its position, be capable of producing with profit a marketable, though not first-class, coal. The coal has been used by various local consumers, and given satisfaction, but the uncertainty of a regular supply and the variable quality—owing, perhaps, to the method of mining followed—at present militate against its use. A shaft has been sunk near the mouth of the tunnel to a depth of 60 ft., passing through grey shale throughout.

Half a mile north of the mine is a quarry, in which a similar conglomerate is also overlying dark shales. At least two faults can be seen here, parallel to the faulting in the mine, but with a downthrow in the opposite direction—*i.e.*, to the south-east.

Half a mile further north, again, in the Toombul Shire quarry the same conglomerate is again observed over dark shales. To the east of this quarry, in the road, is a fault accompanied by a folding of the strata.

Mr. Rands records the occurrence of coal at Kedron Lodge and at Ballinger's. At the latter place (portion 587, outside the present map) a shaft was also sunk recently. Though small pieces of coal may be picked out on the dump, nothing of any value is said to have been met with.

That the coastal area of coal measures in proximity to Brisbane affords some considerable prospects of containing workable coal seams will be realised from the above account of the prospecting already done. A seam of workable thickness and quality has already been found at Nundah, where, however, the step-faulting has hindered its exploitation; another seam was cut through by the Eagle Farm bore, though this requires further proving, and numerous thinner seams occur in various localities. The coal measures, moreover, are on the same geological horizon as the productive Ipswich field, and, to judge by the Eagle Farm bore, must possess a thickness comparable with their development in that district.

When it is recollected that this area has the considerable advantage of proximity to market and deep water over any coal at present worked, it is surprising that efforts have not long since been made to discover the presence, or determine the absence, of payable seams of coal. Attention must be drawn, however, to the faulting shown by the few sections that are visible and to the possibility of this continuing where no sections are to be seen. In any future prospecting operations this possibility will need to be kept in view, and, should satisfactory coal be met with, will render a thorough prospecting advisable previous to any expenditure in opening up the seam.

5.—The Coal Measures of the Yeronga Area.

The coal measures in this area, which so far as is known has never been prospected in any way, are seen in several sections on the railway between Fairfield and Yeerongpilly, as well as in the roads near Yeronga. In these cuttings the beds appear to have a dip of between 10 and 20 deg. and consist mainly of carbonaceous and fossiliferous shales and clays, together with sandstone. The coal measures appear to occupy a narrow and deep valley in the schists, along the western side of which the tuff outcrops, being last seen to the west of Yeronga Station. To the north the tuff alone has resisted denudation, and forms a narrow strip running north through Brisbane, as described by Mr. Rands, and continuing along the boundary between the schists and the coal measures of the coastal area. Immediately overlying the tuff at Boggo road is a conglomerate made up of lumps of a blue quartzite embedded in a sandy base.

The upward boundary of the coal measures is very distinct to the east of Moorooka, where the sandstone forms a bold escarpment over

the shales, or lies directly on and caps the schists. To the south of this outcrop the country is very sandy, and typical of the same horizon in other parts. The boundary is not clear west of the Salisbury road, but what is presumably the same sandstone again appears in the southern bank of the river to the east of the mouth of Oxley Creek. The land to the south of this, between Sherwood and Rocklea, is all low-lying and devoid of any outcrop to assist in determining the boundary with greater certainty. In the river bank near Corinda the sandstone lies directly on the schists.

A general dip of 10 deg. in the strata, as seen in the railway cuttings over a length of almost two miles, should give a depth of about 2,000 ft. at Yeerongpilly, although that is no more than a mile from the schists either to the east or west. The boundary to the east is not a faulted one, and the depth of strata serves to show how irregular was the floor on which the sediments were deposited. It also serves to show that the thickness of coal measures in the Racecourse bore by no means necessarily indicates a faulted junction with the schists a mile away.

Though this area of coal measures is restricted, it is remarkable that no effort has ever been made to prospect them, situated as they are so close to the market.

V.—BUNDANBA GRITS AND SANDSTONES.

A coarse sandstone forms the high southern bank of the river near Oxley, and to the west of this rests directly on the schists, forming the poor sandy country typical of the same horizon elsewhere. In this neighbourhood the sandstone is covered over a considerable area by the more recent Oxley beds, the presence of which assists in obscuring the details of the Trias Jura in the locality.

The sandstone is seen west of Wolston railway station and in the old quarry (Jeay's) on the river bank in the grounds of Woogaroo Asylum. The sandstone is overlying a section of nearly horizontal carbonaceous shales. To the east of Goodna, in a railway cutting showing carbonaceous shales, the beds, which are faulted, dip to the south-west, though close to this, in the road, the dip is south-east.

While there appears little doubt that the sandstones north of Goodna and west of Oxley and Wolston belong to the series overlying the coal measures—this is Mr. Cameron's opinion also—it is not possible to trace their connection with the same series to the south of Goodna. The difficulty is due to the absence of outcrops in the country east of this, which is probably covered by the Oxley beds.

Several bores were put down in search of coal on Archerfield station many years ago, and it is singularly unfortunate that no

record of them is extant, for they are in the country, in which little can be learned from the surface, lying between the easternmost extension of the Ipswich coalfield and the coal measures of the Logan district. Mr. Stewart Browne has kindly presented some pieces of cores which were found on the surface at one of the bores. Besides some sandstone—evidently much weathered—these include several pieces of siliceous and serpentinous schist. At what depth these were obtained it is, of course, impossible to say, but it is unlikely to have been more than 1,000 feet. The softer carbonaceous strata, if present, would almost certainly have completely disintegrated, so that their absence from the few fragments now remaining does not signify their absence from the bore. It seems probable, however, that, had coal of workable thickness been met with in any of the bores, the people who were responsible for the boring would have proceeded to take advantage of it, or at least have preserved the record. It is possible that the schist met with in the bore was a submerged inlier, and not really at the base of the system, a greater thickness of which would have been expected. Water is trickling over the casing of one of these bores on the bank of Blunder Creek, near the centre of portion 47.

Though outside the limits of this report, it is perhaps well to mention here the occurrence of carbonaceous strata at Opossum Creek. The shales are overlain by massive coarse sandstone, similar to that at or near the base of the Bundanba grits elsewhere. It seems not unlikely that a close examination would show that the carbonaceous beds are identical with the Ipswich measures, and not, as their position would suggest, on a somewhat higher horizon.

As the Bundanba sandstone series is followed upwards the coarse sandstone becomes, on the whole, finer, softer, and more impure, the soil resulting from its decomposition also improving. As the beds are traced still further, they become coal-bearing, though there are no means to determine the horizon at which this takes place, or to fix its position on the map other than the known occurrences of coaly beds.

VI.—THE BEAUDESERT (WALLOON) COAL MEASURES.

The area within which coal and carbonaceous shales have been observed extends from portion 20, parish of Jimboomba, three miles east of Cedar Grove station, southwards to the border of New South Wales, and west of a line running south-east from that point. The sandstones in this area are, in general, very impure, and are frequently calcareous, but vary considerably both in hardness and grain, though on the whole softer than the sandstones immediately overlying the Lower coal measures.

The most prominent geological feature, however, is the great

development of volcanic rocks, especially to the south, where they occupy the greater portion of the surface. In the vicinity of Beaudesert a quartzite occurs, which has the appearance of being the product of alteration by the igneous rocks, but nowhere was it actually seen to be due to this cause, and, where contacts of the igneous with the sedimentary rocks are visible, the alteration produced has been very slight, if any at all.

At one place, a mile and a half north of Beaudesert, this quartzite has a beautiful banded appearance, due evidently to the more or less concentric weathering of the iron constituents in the dark portions, which results in the production of white and brown bands surrounding patches of almost black rock. Rounded lumps of the quartzite are sometimes seen on the surface of the basalt near Beaudesert, and are presumably remnants of strata, the softer portions of which have been denuded away. A feature also in the vicinity of Beaudesert is the great abundance of silicified wood to be seen on the surface and in the watercourses.

In his 1889 report, Mr. Rands says he was shown, in portion 20, a bed of highly carbonaceous shale containing streaks of coal. Very little can be seen at the present time owing to the soil on the bank above having slipped and almost covered the shale.

Two miles to the south of this—in portion 39, parish of Mundoolun—2 ft. 6 in. of weathered coal is seen above the water in the creek. This is dipping at about 7° to the west-south-west. Over the coal a thin bed of ironstone is covered by sandstone, and below the coal—the thickness of which could not be seen—is more sandstone.

An analysis of the weathered coal on this outcrop gave—

Moisture	12·2
Volatile hydrocarbons	38·5
Fixed carbon	22·0
Ash	27·3
	100·0

Ash light grey.

The country in this locality is very hilly, and of hard sandstone.

Black shale is exposed in the gully in portion 140 (parish of Logan), west of the basalt of Mount Dunsinane—or "The Razorback," as it is known locally. In portion 125 a well was sunk by Mr. Pitt, who gave the information that four small seams of coal were met with, one of them, at 23 ft., 1 ft. thick; and that the beds were dipping at an angle of 30°. Some pieces of the coal shown by Mr. Pitt are cannel coal, having the dull lustre and more or less conchoidal fracture characteristic of the coals in the district.

In the next paddock, portion 112 (Crozier's), is another well, 37 ft. deep, which is said to have passed through a 3-ft. seam of coal. At the present time only a clay shale, with fragmentary fossils, can

be seen on the tip. In a gully in portion 116 the strata (sandstone) dip south-west at 18°. A well in the same paddock appears to have been mainly in calcareous strata.

To the east of Woodhill and Veresdale is a large area of volcanic rock, to be referred to later, which, almost round its entire margin, is associated with black shales. In portion 13 (Day's), east of Gleneagle Station, is a well—said to be 50 ft. deep—which has passed through a bed of calcareous and coaly shale.

In the south-east corner of portion 94, and further up the gully, a considerable thickness of black fossiliferous shale is seen, which contains occasional thin bands of coal. The dip is very slight, to the south-west.

East of this the shale is capped by the basalt of Mount Dunsinane, but shows on the road at the top of the divide between the Logan and Albert waters. About two miles down this road, on Flagstone Creek, is Mr. G. Ball's property (portion 71), where the occurrence of a 2 ft. 6 in. seam of coal was described by Mr. Rands, who gives the following section:—

	Ft.	in.
Coal	0	8½
Coaly shale	0	2
Coal	0	10
Clay band	0	1
Coal	0	10
Coarse grey sandstone	...	
	2	7½

"A small fault running north 15° west across the creek displaces the seam about 2 ft. The coal dips south 30° west at 12°. The following is a proximate analysis of a sample of the coal taken from the cleanest part of the seam:—

Moisture	8·1
Volatile hydrocarbons	38 7
Fixed carbon	50·7
Ash	2·5

"The coal is a bright, non-caking coal; the ash is white."

At the present time the coal in Mr. Rands' section is covered up by soil from the bank above, but on the other side of the creek it can be seen partly under water. A rough analysis of a sample taken from the whole thickness exposed gave—

Moisture	4·0
Volatile hydrocarbons	25·4
Fixed carbon	31·1
Ash	39·5
	100·0

Excepting the coal seam itself, there are no carbonaceous strata to be seen in the vicinity.

In portion 137 (Gould's), two miles north of Beaudesert, a shaft 15 ft. deep had the following section:—

	Ft.	in
Alluvium	9	0
Grey clay with small bands of coal	2	0
Clay	0	3
Coal	0	6
Clay	0	4
Coal	0	4
Clay shale	0	2
Coal	0	4½
Clay shale	0	2
Coal	0	3½
Shale	0	11
Coal (bottom) at least	1	0

The dip is one in seven to the south-west. A sample taken of the bottom seam gave the following analysis (Government Analyst):—

Moisture	5·0
Volatile hydrocarbons	40·1
Fixed carbon	40·7
Ash	14·2
	100·0

Cakes and partially cakes, without intumescence. Ash, white.

This seam outcrops in the gully, and Mr. Rands gives a section, not now visible, of what is presumably the same outcrop, which shows 1 ft. 4 in. of bright clean coal, a sample of which gave Mr. Joseph Fletcher the following analysis:—

Moisture	8·0
Volatile hydrocarbons	34·0
Fixed carbon	33·0
Ash	25·0
	100·0

Mr. Rands also mentions a shaft—at that time fallen in—in portion 120, in which the coal was said to be thicker than at the outcrop, and gave the following analysis:—

Moisture Volatile hydrocarbons	44·0
Fixed carbon	47 3
Ash	8·7
	100·0

Coal is said to have been found further up the same gully, in a well sunk to obtain water for the boiler of a saw-mill. The coal and water were struck at the same time, and the latter proving unsuitable for the purpose desired further sinking ceased. The coal obtained was burned under the boiler.

Fragments of coal can still be seen on the surface at a well near Birnam House, regarding which Mr. E. I. Warner kindly obtained the information that it was sunk some 26 years ago to a

depth of 87 ft., and "passed through several seams of coal and shale of varying thickness, but at the depth they struck water they appeared to reach a seam of coal that gave every indication of good results." Coal is said to have been found also in the gully above this well, but is not now visible.

In portion 98, near the cemetery, a tunnel has been driven on a seam of coal which shows in the gully at the mouth of the tunnel. The distance driven is said to have been 30 ft. in a north-westerly direction, and the coal in the tunnel to have been at least 4 ft. thick. The coal is said to have been tested, and proved better for gas-making than Walloon coal. A piece of this coal was shown, but as its identity was not absolutely certain no analysis was obtained.

The tunnel has now fallen in, but Mr. Stansfield had the outcrop at the mouth of the tunnel cleaned up, showing the following section :—

	Ft.	in.
Soft sandstone		
Coal	0	4
Clay	0	1½
Coal	0	2½
Clay	0	2½
Coal	1	1
Clay	0	3½
Dark clay shale, at least	1	0

The coal, which was water-logged and much weathered, is laminated, and except for its well-marked vertical joint faces might better be termed a shale.

The following analysis (Government Analyst) is from a sample including the 1½ in. and 2½ in. clay bands :—

Moisture	15·8
Volatile hydrocarbons	20·4
Fixed carbon	13·6
Ash	50·2

Does not cake, coke, or intumesce. The colour of the ash is grey.

It appears improbable that the outcrop at the mouth of the tunnel—a seam not more than 2 ft. thick—would increase to over 4 ft. in a distance of 30 ft. As the coal has not disintegrated, but is still reasonably hard on the outcrop, it is not likely that the seam has been much reduced by the weathering. It is probable that the dark clay shale beneath the coal has been included in the 4 ft., the bottom of which is not shown in the above section, and may possibly be coal. The fuel ratio in the above analysis would certainly give a coal "better than Walloon" for gas-making, if the percentages of moisture and ash were within reason.

Further up the gully is a section of bent and faulted carbonaceous strata, and in a branch gully Mr. Stansfield pointed out a place where he had previously observed an outcrop of coal, since covered by the action of the watercourse.

Near the heads of these gullies black shales overlie basalt, which appears to dip, with the shales, nearly parallel to the slope of the hill. On the top of the ridge is sandstone and shale. The basalt showing again on the eastern fall appears to be interbedded with the sedimentary rocks, and a section of the Tabragalba road shows the same relationship. Another section in a gully to the south-east of this also shows a thin bed of basalt in black shales, the basalt having rather the appearance of a sill than of a contemporaneous flow. The section is, however, not very clear and is faulted, while the vesicular character of the rock would rather point to its being a flow. The shales both above and below the basalt do not appear to have undergone any alteration from the contact. What dips can be observed in this neighbourhood are discordant.

For some four miles west of Beaudesert the country is level, and shows few outcrops of any sort; beyond this, however, it becomes very hilly. In portion 69A (Jennyns's) is a small quarry in a buff-coloured fine-grained sandstone, which appears to be capable of quarrying with ease into well-shaped blocks requiring little further dressing for building purposes. Mr. Jennyns states that this stone has been used for grave-stones, and stood the weathering well; also that it has been tried for grindstones, but was not loose enough in the grain for that purpose. From its appearance in the quarry, some of the beds would probably not stand exposure to the weather, but for ornamental work in the interior of a building the stone should prove very suitable, if distance from the city allows of its use. The dip in the quarry is 40° to the east.

Mr. Jennyns's house is on a small patch of basalt, to the south of which is black shale.

The ridge on which is the quarry continues southward into portion 68 (Rafter's); black shale is exposed in the gullies on the western side of this ridge, at the south end of which a seam of coal outcrops in the creek. A hole was recently sunk on the outcrop, now obscured, and some of the coal obtained was certainly nice bright, clean-looking coal. From the accounts given of the thickness of the seam—the hole is now full of water—2 ft. is a generous measurement. The seam occurs in sandstone, dipping to the east at about 30°; a little further down the creek the dip is somewhat steeper. Apart from the steepness of the dip the seam is too thin and too far from railway communication to be of any commercial value.

At the time of Mr. Rands' visit the outcrop was more plainly exposed, and he gives the following section:—

	Ft.	in.
Sandstone	..	..
White clay	..	...
Coal	1	7
Fireclay	0	1½
Laminated sandstone	..	..

An analysis of the coal obtained recently gave—

	Per cent.
Moisture	3·0
Volatile hydrocarbons	28·9
Fixed carbon	41·7
Ash	26·4
	100·0

In appearance as well as in the ratio of the volatile constituents to the fixed carbon, the coal is similar to the coals of the Ipswich measures.

The easterly dip of the strata in this neighbourhood, the reverse of that east of Beaudesert, gives place again to a westerly dip west of Allan's Creek.

Oil was supposed to have been discovered on the surface of several of the waterholes in this district, but the discoverers appear to have been misled by the greasy-looking scum on the surface resulting from the oxidation and precipitation of the iron salts in the water.

The foregoing details show that east of the railway line, between Cedar Grove and Beaudesert, there is a considerable area of country in which the occurrences of carbonaceous shales and thin coals are numerous. In two places seams over 2 ft. 6 in. thick have been observed, but their situation scarcely warrants any exploratory work at the present time, though the weathered outcrop in portion 39, parish of Mundoolin, gives considerable promise of proving a valuable gas coal should transit facilities allow.

While it cannot with certainty be said that a workable seam has yet been discovered near the railway, the indications certainly encourage a thorough prospecting.

Coal if found is almost certain to be chiefly suitable for gas-making, its use for boiler purposes being limited to the small local demand by the competition of the Ipswich steam coals. As a gas coal, however, it might prove superior to the existing supplies, since some of the analyses show a high relative proportion of volatile constituents, indicating, besides a great quantity, a probable high quality of gas for illuminating purposes.

VII.—OCCURRENCE OF COAL SOUTH OF BEAUDESERT.

While an inspection has been made of all the outcrops of coal which could be heard of, the primary object in visiting the localities south of Beaudesert, particularly those near the Macpherson Range, has been to verify or otherwise the frequently rumoured occurrence of "kerosene shale."

These rumours are widespread, and have even found their way into print, a well-known journal, in an article dealing with the Australian oil industry, making the following statement:—"Queensland has enormous deposits of kerosene shale, similar to those of New South Wales, along the Northern flank of the Macpherson Range."

Every supposed occurrence of kerosene shale which the writer could hear of east of Mount Lindesay was visited, but in no case was any true kerosene shale found. In several places, however, thick seams of coal were observed, which, though at present too difficult of access and too far from the market to offer any prospects of profitable working, will doubtless some day be of considerable value. For this reason, as well as on account of the likelihood of light being thrown on the geology of other places, it is desirable that a thorough geological examination of the district should be made.

The road from Beaudesert to Christmas Creek appears to keep close to the margin of the basalt, which forms hills on the eastern side of the road for the greater part of the distance. At Lara a well in Mr. Tarlinton's property struck coal at a depth of 45 ft., getting water at the same time. This well is close to the basalt.

In the road from Innes Plain to Palen Creek black shale with streaks of coal dips, in portion 7, at an angle of 75° to the east, half a mile. North of this the strata dip at 80° to the north-west. Near Messrs. Jas. Campbell and Sons' mill (portion 8) on Palen Creek, the hills on either side of the creek are sandstone, capped with basalt. Further up the creek trachytic and rhyolitic rocks make their appearance, little else showing between this and Mount Lindesay. In portion 25v a cutting on the road is in black shale, and in portion 37 (T. Egan's) a seam of coal outcrops in a tributary of Palen Creek. The coal is dipping to the west, and, though an accurate measurement could not be made, it appeared to be 3 ft., or perhaps 4 ft. thick.

This outcrop gave the following analysis (Government Analyst):—

Moisture	4·4
Volatile hydrocarbons	35·4
Fixed carbon	45·7
Ash	14·5

Ash, light pink. Cakes and partially cokes.

West-north-west of Mount Lindesay, in Crown lands, near the corner of portion 26, Mr. Hardgrave pointed out a seam of coal which must be at least 15 ft. thick outcropping in a gully running into the Logan River. The seam is dipping at 65° towards the mountain, near the base of which it is situated. The coal in its weathered condition is hard, dull, and rather stoney looking, and appears to resist denudation better than the accompanying rocks. An analysis (Government Analyst) of this outcrop gave:—

Moisture	5·1
Volatile hydrocarbons	30·1
Fixed carbon	40·8
Ash	24·0
	100·0

Ash, light pink. Neither cakes nor cokes.

Near the south-eastern corner of portion 26, and at some height up the Palen Creek fall of Mount Lindesay, is another outcrop. This, which has a slight dip to the south, is 12 ft. thick. The coal has a similar appearance to that mentioned above, and gave the following analysis (Government Analyst):—

Moisture	3·7
Volatile hydrocarbons	31·9
Fixed carbon	34·4
Ash	30·0
	100·0

Ash, light pink. Cakes, but does not coke.

Beneath the coal is soft and impure sandstone. These samples were taken from the outcrop, and it is not unlikely that, away from the effects of weathering, the coal would improve greatly. The situation is, however, so difficult of access and so far from the market as to prohibit any possibility of the coal being worked profitably, no matter how high the quality—at any rate for many years to come.

When these two seams were first discovered it was thought by the finders, probably on account of its dull appearance, that the substance might be kerosene shale. A report on a sample sent to Brisbane for determination soon dispelled any hopes that may have been held on that score.

About two miles above Tylerville the following section is seen in the bank of Palen Creek:—

	Ft.	in.
Black shale	1	6
Coal	0	10
Sandstone	1	0
Coaly shale	2	0

The dip is slight, to the north-east.

SKETCH MAP
Shewing
LOCALITIES SOUTH
OF
BEAUDESERT
Illustrating Report by
E. O. Marks B.A., B.E

Scale of Miles 0 1 2 3 4 5 6

Drawn at The Geological Survey Office for The Q'land Govt. Mining Journal.
E.E.E.

BEAUDESERT
Tabragalba
Nindoinbah
Sandy Ck
Allans Ck
RIVER
LOGAN
Cannon Creek
Knapps Ck
Tarlingtons Coal Laravale
Tabooba Sh
Tamrookum
Telemon
Innes Plain Station
Sh. & Streaks of Coal
Oaky Ck
Christmas Ck Stations
Ladybrook
Burnetts Ck
Mt Maroon
Mountain Ck
Basalt over Sandstone
Campbells Mill
Palen
Sh
Egans Coal 3'
Coal 18"
Coal 14"
Tylerville
Coal 10"
Coal 15'
Coal 12'
Rhyolitic Rocks
Trachytic
Diggings Mt Lindesay
NEW SOUTH WALES
Basalt
Grinbable
Mt Witheren
ALBERT RIVER
Columban Trachyte
Coal 18"
Mt Warrie
Mt Roberts
Mt Cordeaux
Mt Clunie
Mt Lindesay
Mt Barney
Mt Ballow
Mt Lamington
Mt Maroon
Mt Moffatt
Mt Ernest
Mt Hobbs
Mt Merino
Hobwee
Toolona
Mt Warrenoo
Mt Wupawn
Mt Duringan
Mt Gipps
Richmond Gap
Running Creek
Supposed Kerosene Sh
Coal 8'
Buchanans Font
Sa Vertical Containing fragments of Ba
Sa over Ba
LAMINGTON PLATEAU
Mt Merschaum
Flynns Flat
Black Mare
Basalt in bed of Ck
3 Coaly Sh
Little Nerang
COOMERA
Canungra

In portion 34 a seam of coal outcrops in a branch of Back Creek. The outcrop has a thickness of 1 ft. 6 in., a rough analysis giving:—

	Per cent.
Moisture	7·1
Volatile hydrocarbons	32·6
Fixed carbon	35·9
Ash	24·5
	100·0

About a mile further up Back Creek, in Crown land, is another outcrop, 14 in. thick. Only 6 in. of this appeared to be good coal, and it gave—

	Per cent.
Moisture	7·8
Volatile hydrocarbons	35·3
Fixed carbon	39·1
Ash	17·8
	100·0

Basalt occurs along the road going up Widgeo Creek, and in the creek near Jas. Campbell and Sons' old sawmill. A cutting in the tramline in connection with the mill is through sandstone. Coal outcrops in the bank of the creek about a mile above the mill, and a little further up the creek is what was supposed at one time to be kerosene shale. This had been covered up by the creek, but a little excavation exposed at least a foot of brownish-grey carbonaceous shale, an analysis (Government Analyst) of which is interesting, on account of the high relative proportion of volatile hydrocarbons shown:—

	Per cent.
Moisture	5·9
Volatile hydrocarbons	18·3
Fixed carbon	6·8
Ash	69·0
	100·0

Ash, light pink.

It is perhaps needless to remark that this is of no commercial value.

A mile further up the creek coal outcrops in the property of Mr. Steinhardt (9T). There are at least two seams in the bed of the creek, one of which, 10 in. thick, is a nice bright-looking coal, and gives (Government Analyst):—

	Per cent.
Moisture	2·3
Volatile hydrocarbons	39·4
Fixed carbon	49·3
Ash	9·0
	100·0

Ash, light pink. Cokes slightly.

In the bank of the creek opposite Mr. Steinhardt's, in portion

2T, is a seam of coal which, as far as could be seen from the weathered outcrop, has a thickness of about 8 ft. A sample of this gave the following analysis (Government Analyst):—

	Per cent.
Moisture	4·1
Volatile hydrocarbon	36·7
Fixed carbon	42·2
Ash	17·0
	100·0

Cakes, but does not coke.

The sample was as general a one as could be obtained from the partially obscured outcrop without excavation. It is probable that this coal would prove to be of excellent quality where unaffected by weathering, but, though not difficult of access, the distance from any market—it is seven miles from the proposed extension of the Beaudesert tramline—will prevent its exploitation, at any rate in the immediate future.

Coal is said to have been found about a quarter of a mile higher up the creek, but, owing probably to the creek being here much obscured by undergrowth, this outcrop could not be located.

In a bend of Christmas Creek, between portions 62v and 72v, Mr. Buchanan pointed out the only place on Christmas Creek where he knew of the occurrence of coal or black shale. Unfortunately, at the present time the soil from the bank above has slipped and covered up the carbonaceous bed, which Mr. Buchanan states was perpendicular, like the sandstone beside the spot pointed out. This sandstone is of particular interest, for it includes rounded fragments of vesicular basalt, and is thus obviously later than at least a portion of the basaltic rocks which form the mountainous country of this neighbourhood. A similar sandstone occurs on the ridge between Christmas and Widgee Creeks, and is presumably covered by the basalt of Buchanan's Fort. In portion 23v, in the bank of the creek a similar sandstone rests on basalt, which here forms the creek bed. Though basalt was not actually seen overlying this sandstone, there is little doubt that it does, for this is at the base of the Lamington Plateau, which is composed of basaltic rock, and rises to a height of 3,000 ft.

A seam of coal outcrops in the bank of Kerry Creek, in portion 53A, parish of Kerry. This seam is 1 ft. 6 in. thick, including a 2-in. band, and is dipping at about 10° to the south-west. Some portions of the seam, which is very much weathered, are extremely hard.

Lumps of coal are reported to have been found in Cainbable Creek, but no outcrop could be heard of. Between portions 3K and 12, parish of Nindooimbah, the creek flows through a cutting in columnar trachyte.

CHRISTMAS CREEK AND LAMINGTON PLATEAU.

Some 3 ft. of dark coaly shale is exposed in the Coomera River, in Crown lands, about a mile above the highest holding. A tunnel was driven on this years ago, in the hope, it is said, of it proving to be kerosene shale. Nothing on the outcrop now would warrant any expectation of that nature.

Above this bed of shale, which rests on sandstone, are soft sandy and shaly strata. For some miles down the Coomera from this spot basalt is the only rock visible. Several cuttings on Messrs. Lahey's tramline in connection with their sawmill at Cannungera are in sandstone.

In his 1889 report, Mr. Rands mentions the occurrence of infusorial earth at Meerschaum Mountain, which, however, he did not visit personally. This is in portion 37, parish of Witheren.

On ascending the hill the first rock met with is sandstone, which soon gives place to basalt. Near the top the pure white infusorial earth outcrops entirely round the hill, and is apparently sandwiched between two flows of basalt, the upper of which forms the actual summit of the hill. Mr. Jerome has also observed the same substance on another summit of this hill, but it is here covered by scrub, and could only be located again with difficulty. A precisely similar rock has also been obtained on Nerang Creek.

VIII.—OXLEY BEDS.

In the neighbourhood of Oxley, and extending from there south-west to near Goodna, and south-east for some distance up Oxley Creek, is a formation to which attention was first drawn by Mr. H. G. Stokes, some notes by whom are given by Dr. Jack in "The Geology and Palæontology of Queensland and New Guinea." These beds are characterised by an abundant dicotyledonous flora, and consist, in the main, of clays and slightly coherent sandstones. In places, however, the rocks are harder, and cannot, in the absence of fossils, be distinguished with certainty from the Trias Jura.

In his Annual Progress Report for 1900, in reference to the occurrence of similar fish-bearing strata at Duaringa, on the Central Railway, Mr. Dunstan makes some observations on the Oxley beds, to which little need here be added. Mr. Cameron found similar beds containing fish remains under the basalt at Redbank Plains, and it is interesting to note that the Oxley beds are also overlain by the basalt of Cooper's Plains, which in the bank of Oxley Creek. is either faulted against or fills a channel cut in them.

In the Queensland Museum is a *Ceratodus* tooth obtained from a well in Mr. A. Williams's property at Runcorn. This well was sunk

through the basalt to a depth of 250 ft., and Mr. Williams states that leaf impressions were also found, but the clay containing them was too soft to preserve.

Some "kerosene shale" met with was probably similar to the carbonaceous shale which Mr. Dunstan records at Duaringa.

The locality between Runcorn and Kuraby Station was formerly included under the name of Eight-mile Plains, and the *Ceratodus Fosteri* and *Pallimnarchus pollens* identified by Mr. De Vis, and referred to by Dr. Jack in Appendix IV. of his book, doubtless came from Mr. Williams's well.

The age of the Oxley beds has been the subject of some controversy, but later opinion seems to favour their being ascribed to a Tertiary epoch, the above fossils being referred to by Dr. Jack as of species still living.

In a clay pit in this formation, at Darra, one of the beds is rendered almost black by the included carbonaceous matter, and a film of carbon, which flakes off when dry, still remains in the leaf impressions. Though generally undisturbed, the railway cuttings near Oxley show these beds to be faulted.

Owing to the difficulty of distinguishing the Oxley beds from the Trias Jura, the area shewn on the map must be considered as indicating their presence rather than marking their limits, which probably include a much greater area.

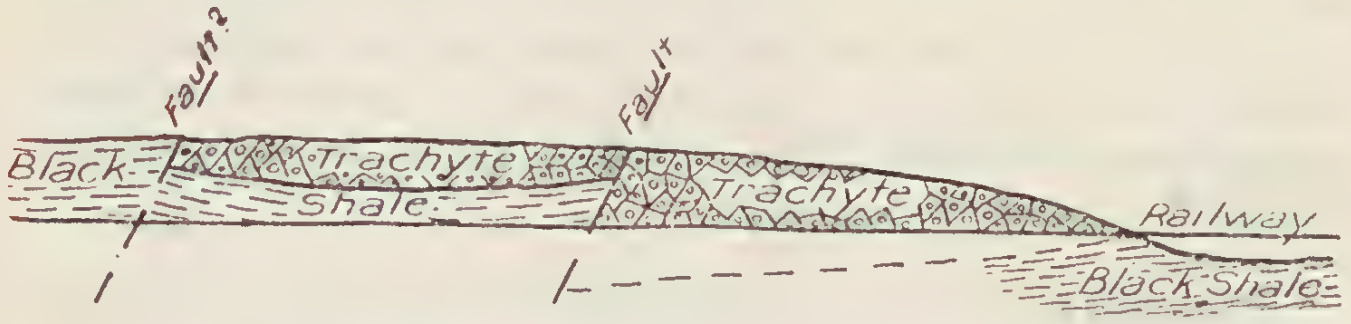
IX.—VOLCANIC ROCKS.

Excluding the Brisbane tuff lying at the base of the Trias Jura system, the volcanic rocks of South-east Moreton can be ascribed to two distinct ages. The older rocks appear to be contemporaneous with the upper coal measures, and are developed in the southern part of the area under consideration, while the younger rocks are subsequent to, or at least contemporaneous with, the Oxley beds, and occur in the northern part of the area.

Older Volcanic Rocks.

To the east of Woodhill and Veresdale a considerable area is covered by an igneous rock, which forms low rounded hills, and is associated with black shales almost round its entire margin. This rock was described by Mr. Rands as a trachyte containing beautifully developed crystals of saindine felspar. At present the rock, which weathers spheroidally, is too decomposed for determination, but the felspar crystals can be seen embedded in the more decomposed

ground mass. In the section in the railway cutting north of Woodhill (formerly Walton), Mr. Rands considered the trachyte as having "come up through the coal measures and overflowed a portion of



Section in Railway Cutting, Woodhill.

them." This is illustrated in Fig. 2 accompanying his report. An examination of the section at the present time shows it to have more the appearance of a faulted (overthrust) junction, and this view is strengthened by the sharp change from trachyte to shales on the road in the direction of strike of the fault.

Mr. Rands describes how, in portion 122, the trachyte crops out on either side of a small ridge, and is covered by sandstone, shale, and a hardened siliceous sandstone. It is interesting to note that the hardened sandstone or quartzite, similar to that mentioned previously in the neighbourhood of Beaudesert, is not in contact with the igneous rock, which does not appear to have effected any alteration in the strata either above or below it.

Though this rock may be an intrusive sill, Mr. Rands' view that it is a contemporaneous flow certainly appears more probably the correct one, taking into consideration the lack of alteration induced in the sedimentary rocks, as well as the apparent parallelism with the beds in which it occurs. Two smaller patches of a rock, which, to judge by its weathering, is similar to the above, occur between Gleneagle and Beaudesert.

The basalt of Mount Dunsinane is a fine-grained dark rock, and, north of Flagstone Creek road appears merely to cap the ridge, while to the south it is vesicular, of a lighter colour, and is either an interbedded sheet or a sill parallel to the bedding. Attention has already been drawn to the association of this basalt as well as the Woodhill trachyte with carbonaceous shales. About four miles east of this a high ridge in Tabragalba is capped by basalt, which also forms the summit of Cannungera Mountain, and is there continuous with the Macpherson Range. East and north-east of Cannungera Mountain the basalt of Tamborine forms a long and comparatively flat-topped mountain, 1,800 ft. high, with steep or precipitous sides. The basalt—or, rather, andesite—seems to be the result of at least two flows, the later of which has developed in many places a well-marked columnar structure. The earlier flow, as seen in the head of Sandy Creek, has more of a laminar structure, and is more readily

decomposed. It is presumably to this difference in character that the "shelves" along the sides of the mountain are due. Though usually but one shelf, there are sometimes more, and it is at the edge of the lower one that the sandstone on which the basalt rests is last seen. The contact between the basalt and the sandstone is by no means level, being, near the base at the north end of the mountain and in other places, at least 1,000 ft. up the side. On the east the basalt is lying on schists.

While the evidence as far south as Beaudesert that the volcanic rocks of the district are contemporaneous with the upper coal measures cannot be considered conclusive, there appears no reason to regard them as more recent. As Dr. Jack points out, the basalt of Tamborine Mountain is capping rocks which are low in the system, and is not, therefore, necessarily later than the volcanic rocks which occur on a higher horizon. In recording the occurrences of coal south of Beaudesert mention has been made of the occurrence at Christmas Creek of a carbonaceous bed, together with a sandstone containing rounded lumps of vesicular basalt, and of a similar sandstone overlying, as well as overlain by, basalt. In the absence of any detailed examination, this can leave little doubt as to the Trias-Jura age of the basaltic rocks which form this part of the Macpherson Range, though the general appearance of the mountains might have led one to suppose that they had been carved out by the streams from a volcanic plateau of more recent formation. The basalts of the Macpherson Range are probably of the same series as those of the Darling Downs and Main Range, and it is of interest here to recall that Dr. Jack considered those to be contemporaneous with the Trias-Jura rocks with which they occur. The association of the coals, both of Rosewood and the Darling Downs, as well as of the Beaudesert district, with the volcanic rocks of those places, is probably more than a mere coincidence, and until a detailed examination of the country throws more light on the subject there appears no reason to consider these basalts of a later date than the coal measures with which they are found. In a recent paper* Dr. H. I. Jensen considers these rocks, however, of a much later age, and says that "on the Darling Downs we have the Upper and Lower Cretaceous and the whole Jurassic and Triassic underlying the Tertiary (Pliocene?) basalt flows." It is greatly to be regretted that Dr. Jensen does not state the locality where this occurs, nor give any reference as to the source of his information, for neither is this shown on the maps of the geological survey, nor has any account of it, so far as the writer is aware, ever been published. It is unfortunate that this is the only place where Dr. Jensen gives any reason

* "Notes on the Geology of Mt. Flinders and Fassifern districts, Queensland." by H. I. Jensen, D. Sc. Proc. Linnean Soc., N.S.W., Vol. XXXIV., Part I.

COLUMNAR BASALT, TAMBORINE MOUNTAIN.

for ascribing the volcanic rocks he deals with to a later age than the coal measures, as the question, which has already been the subject of some discussion, is of considerable geological interest, and may possibly in the future have a commercial aspect as well.

Newer Volcanic Rocks.

Mr. Cameron refers to the occurrence at Redbank Plains of a volcanic rock overlying strata apparently of the same formation as the Oxley beds. Decomposed basaltic rocks are found overlying the Oxley beds at Cooper's Plains and at Runcorn, and probably at Corinda and Eight-mile Plains also.

Stretching along the shore of Moreton Bay from Redland to near Manly is a narrow strip sharply distinguished from the general sandy country by the possession of a rich red soil. It is only near Birkdale and Manly, however, that this soil is observed to be due to the decomposition of a volcanic rock, which is probably of the same age as those mentioned above. This rock appears to surround the higher ground at Manly, being visible in places along the beach.

These later rocks are found for the most part occupying low ground, the higher ground in the neighbourhood being formed, as a rule, of sedimentary rocks. This is in striking contrast to the older volcanic rocks, and is additional evidence of comparatively recent age.

Brisbane, December, 1909.

By Authority: Anthony James Cumming, Government Printer, Brisbane.

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GEOLOGICAL MAP
OF
SOUTH EAST MORETON
COAL MEASURES

To accompany Report Nº 225

by

E. O. MARKS B.A., B.A.I
Assistant Government Geologist

1910

Scale of Miles

0 1 2 3 4

Drawn at the Geological Survey Office, Brisbane, Queensland.
D. Fox Draftsman.

Compiled in part from information previously collected by Officers of the Geological Survey.

MORETON BAY

WATERLOO BAY

RABY BAY

BRISBANE

NORTH BRISBANE

SOUTH BRISBANE

TOOMBUL

BULIMBA

TINGALPA

CAPALABA

CLEVELAND

REDLAND

WYNNUM

MANLY

TINGALPA

YEERONGPILLY

OXLEY

COOPERS PLAINS

SUNNYBANK

EIGHT MILE PLAINS

BOONAH

WOOGAROO

MT CHELMER

MACKENZIE

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		Bundanba Sandstone	Bd	Brisbane Tuff	Tf
		Lower or Ipswich Coal Measures	I	Basalt, Trachyte &c	B Tr

Trias Jura :—

Faults showing down throw

Dip of Strata

Highly inclined Strata

Printed at the Government Printing Office, Brisbane. 1910.
Price. 1s. per Sheet, Complete in two Sheets, 1s. 6d.

Cutting Line

Sheet 2. South East Moreton Coal Measures

Scale of Miles

0 1 2 3 4

Drawn at the Geological Survey Office, Brisbane, Queensland.
D. Fox Draftsman.

Price 1s 6d Complete or 1s per Sheet.

Scale 20 Chains to an Inch

0 20 40 60

"MONA PARK"
•Diamond Bore 500'
•Calyx Bore 291'
•Diamond Bore 363'
Diamond Bore 450'

Coal 15"
Lagoon
Swamp
Schist
Escarpment
Shale & Coal
Shale & Coal 6" Impure slight
Old Shaft
Bore 34'
Shaft 75'
Shale
Ingelara Sandstone
Shaft 40'
Log Creek
Buccan Stn
Quinkeh
Escarpment
Alluvium
LOGAN RIVER
BEAUDESERT RAILWAY
Ooch Ooch

PARK RIDGE
Bd.
Logan River
Logan County
Yarrol Creek
Timber Reserve
Buccan Stn
Logan Village Stn
Water Reserve
WOLFDENE
Chambers
Norris's Ck
Sandy
Kooralbyn Ck
North MACLEAN
South MACLEAN
Jimboomba
Jimboomba Stn
Henderson's Ck
Scrubby Creek
Cedar Grove Stn
Martindale
Martindale Stn
Woodhill Stn
Veresdale Stn
VERESDALE
Veresdale Scrub
Cypress Ck
Gleneagle Stn
Mt Dunsinane
Laheys Siding
Beaudesert
Race Course Reserve
Beaudesert Reserve
Section Line FG
Birnam Range
Clutha Creek
Albert River
Albert Bridge
TAMBORINE
Tamborine Mountain
Coburg
Canungra Creek
Canungra Mountain
Tabragalba
Mundoolun
Mundoolun Creek
Sandy Creek
Scrubby Creek
Spring Creek
Teviot Brook
Teviot "OVERFLOW"
Allen's Ck
Crowe's Track
Woolloman Creek
Undullah Creek
Undullah Brook
Logan River
Albert River
Nerang River
Canungra Creek
Running Creek
Cedar Creek
Tamborine Ck
Guanaba Ck
Waterfall Creek
Hotham Creek
Pimpama Creek
Onmeau Stn
Pimpama Stn
Yatala Bridge
Yatala
Stapylton Stn
Scrubby Creek
Hotham Creek
Pimpama River
Pimpama Island
Reserve for Timber & Gravel
Race-Course
Reserve for Public Purposes
Falls Reserve
Water
Quarry
Sch.
Shaft
Bore
Coal (Watts)
Coal in well
Coal reported in Bore
Sandstone with Calcareous Nodules
Calcareous Sandstone
Rafter's Coal
Tramway
Section Line
Fault
Dip of Strata
Highly inclined Strata

UNDULLAH
JIMBOOMBA
MUNDOOLUN
TAMBORINE
BROMELTON
TEVIOT
BEAUDESERT
NINDOIMBA
TABRAGALBA
CANUNGRA
PIMPAMA
BARROW
MORTON
DARLINGTON
LAMINGTON
BOYD
ALBERT

S1 "NOOYA"
S2 WINDAROO
S5 BANNOCKBURN
S4 "NOOYA"

INDEX TO COLOURS & SIGNS

- Oxley Beds — R
- Trias Jura :—
- Upper or Walloon Coal Measures — W
- Bundanba Sandstone — Bd
- Lower or Ipswich Coal Measures — I
- Gympie Formation (Schists &c) — F
- Brisbane Tuff — Tr.
- Basalt, Trachyte &c — B Tr.
- Faults showing down throw
- Dip of Strata
- Highly inclined Strata

Section ABCDE from Brisbane River at "Wolston" to Moreton Bay at Manly
Horizontal Scale same as Map, Vertical Scale exaggerated

Brisbane River — Wolston House — Railway — Bd — R — Oxley Creek — COOPERS PLAINS — Rocklea Rly. Stn. — Bd — W — Mt GRAVATT — LOGAN ROAD — Bulimba Creek — "BAYVIEW" — Railway — MANLY — MORETON BAY

Section FG running N.E. from Veresdale
Horizontal Scale same as Map, Vertical Scale exaggerated

Railway — VERESDALE — MARTINDALE — Scrubby Creek Coal — ROAD — BIRNAM RANGE — ROAD — ROAD — Watt's Coal — Bd — ROAD — Bd — N.E.

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